IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

DIESEL PROGRESS

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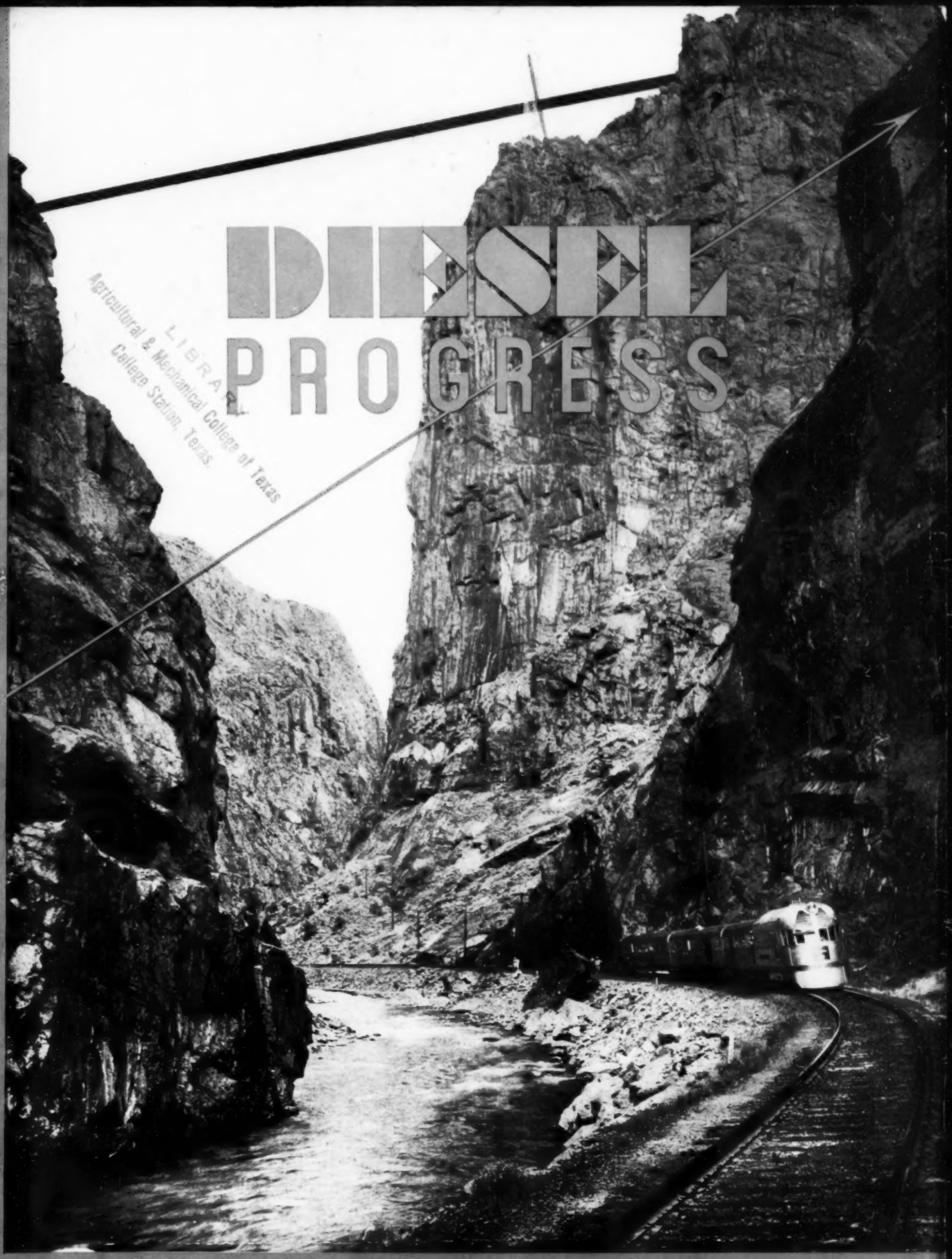

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The Greatest Diesel Experience.

Socony-Vacuum
Correct Lubrication
—based on 72 years' lubricating experience and 38 years' Diesel lubricating experience—has proved its economy in thousands of plants

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WHEN YOU BUY Socony-Vacuum's Gargoyle D.T.E. Oils you get something no other company can offer... *Diesel lubricating experience that dates back to the very first Diesel!*

This experience shows in the *oils themselves* ...and in the *service* that comes with them!

Gargoyle D.T.E. Oils meet the *exact* requirements of modern Diesels. They have:

1. The body and film strength to prevent costly bearing and cylinder wear.
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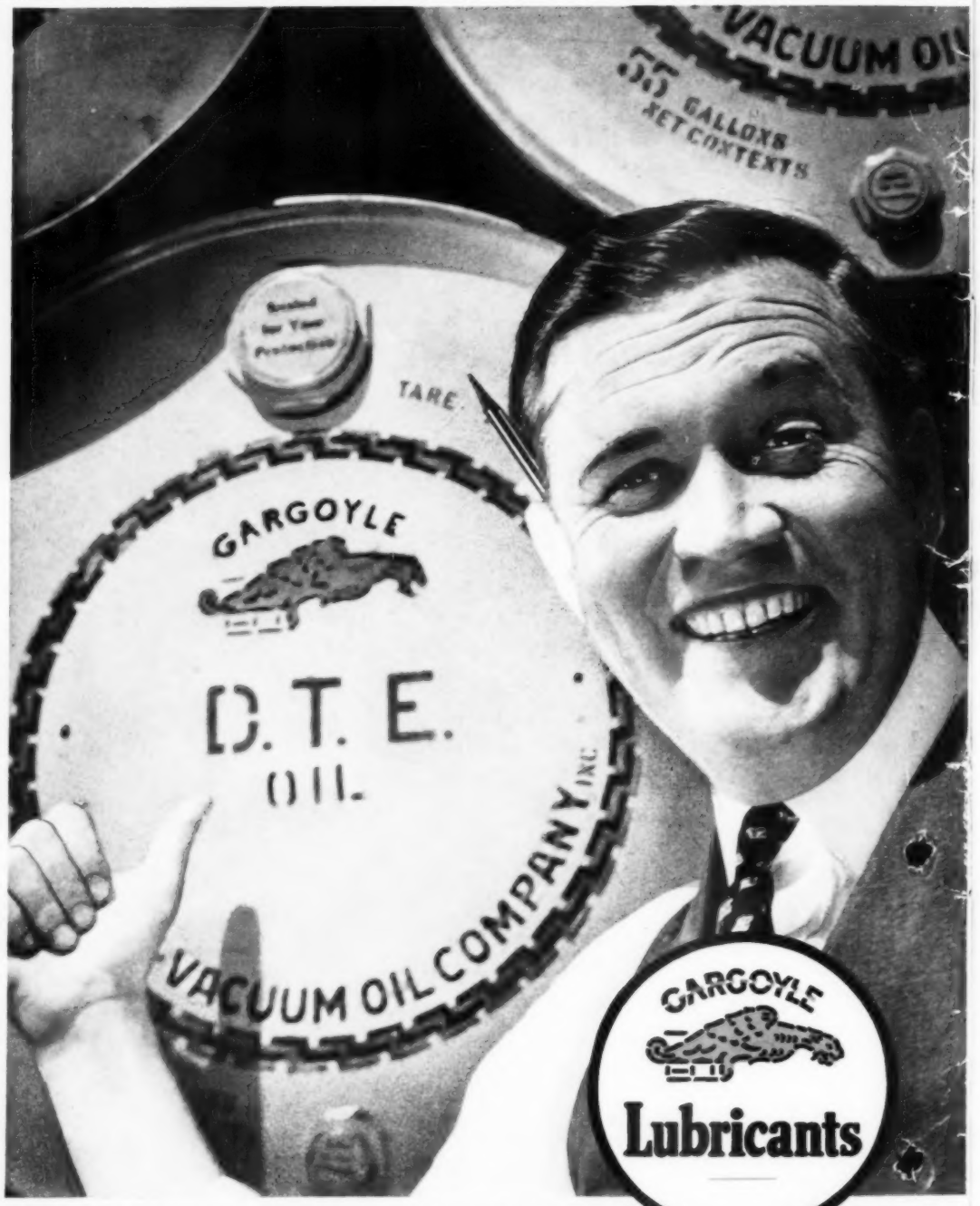
In addition, Socony-Vacuum "Correct Lubrication" puts a trained lubrication engineer at your service. He's ready to apply his company's lubrication experience to your problems...to help your men get every ounce of economy out of your engines.

Isn't it worth your while to find out more about what "Correct Lubrication" will do for you? Talk with the Socony-Vacuum Representative when he calls at your plant!

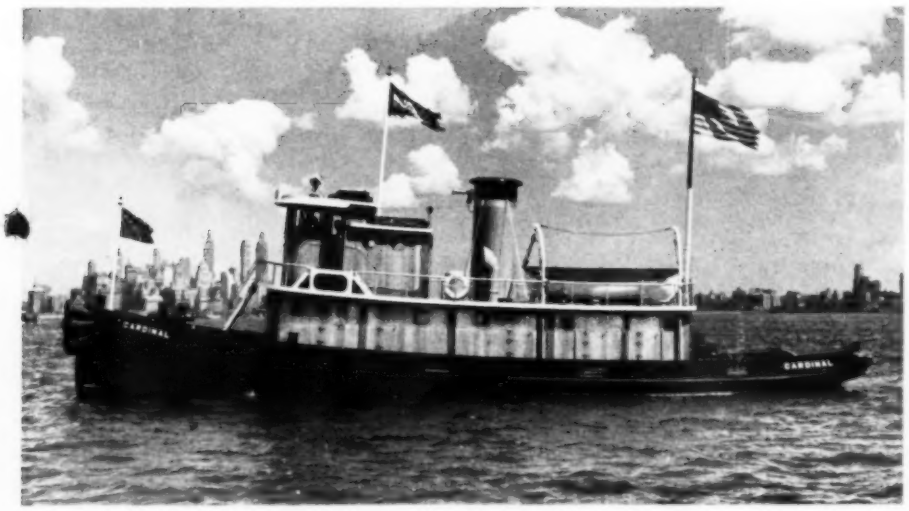


SOCONY-VACUUM OIL CO., Inc.

STANDARD OIL OF NEW YORK DIVISION · WHITE STAR DIVISION · LUBRITE DIVISION · MAGNOLIA PETROLEUM COMPANY
CHICAGO DIVISION · WHITE EAGLE DIVISION · WADHAMS OIL COMPANY · GENERAL PETROLEUM CORPORATION OF CALIFORNIA

YM FOLLOWS YM•••

in the Moran Fleet . . in the Bushey Fleet

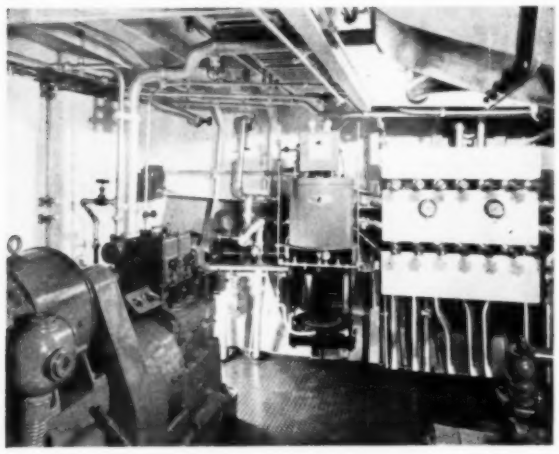


because their first ones made good.

Neither the Moran nor the Bushey fleets use Y-M Oil Purifiers exclusively . . . But the last ten ships built for these two famous fleets have been Y-M equipped.

Repeat orders tell the story.

These owners have discovered that Y-M Oil Purifiers prevent stuck piston rings, reduce make-up oil consumption and keep crankcases absolutely free from sludge deposits. On these Motorships, no used lubricating oil is ever discarded—It is kept usable, year after year, and in fact becomes progressively better than new parent oil in resistance to gum formation.



THE Y-M INSTALLATION ON THE TUG "CARDINAL"

Y-M Purifiers remove fuel dilution, acids, water, sludge material and dirt, and restore new oil appearance. Even oils which are severely emulsified by water jacket leakage are salvaged for reuse as new oil.

It will profit operators of Diesel Engines, whether Stationary, Marine or Automotive to investigate the valuable service which these machines can render in the salvage of lubricating oils and in improving the performance of the engines.

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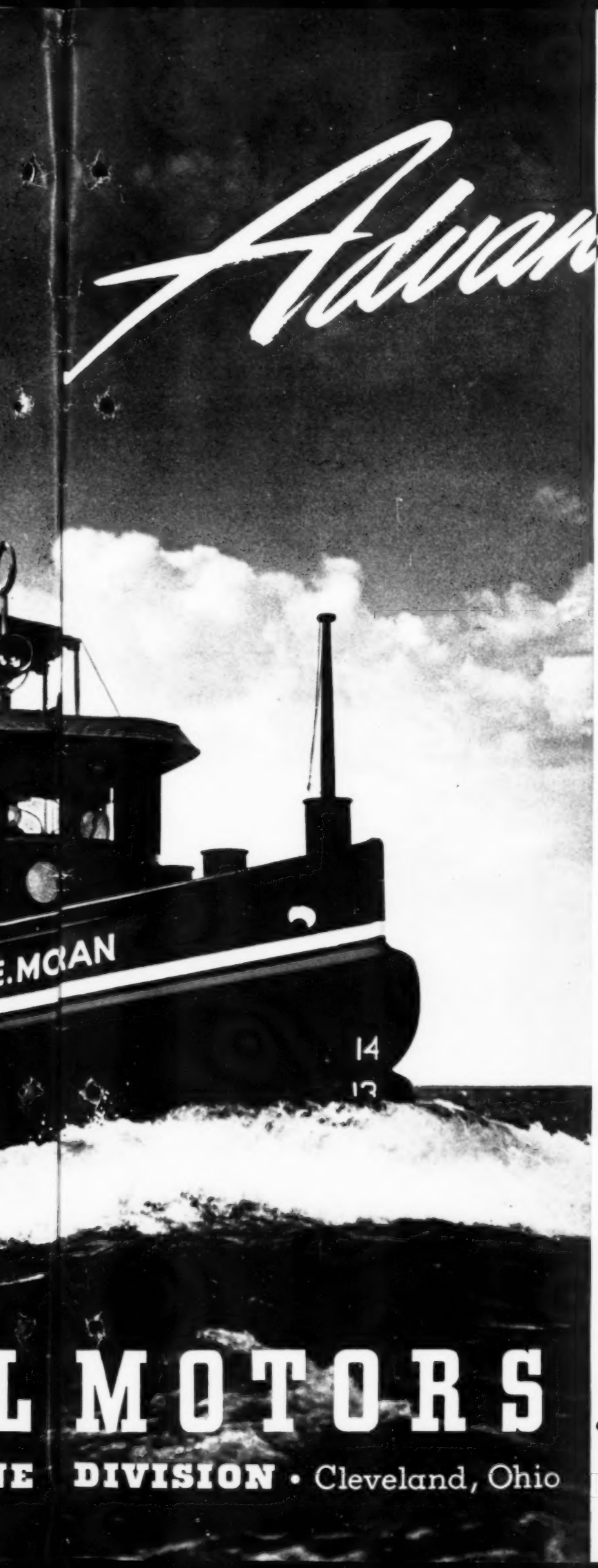
LUBRICATING OIL PURIFIERS

for STATIONARY, MARINE *and* AUTOMOTIVE APPLICATIONS

The THOMAS E. MORAN (below)

is one of two new all-steel towboats, designed by Tams, Inc., and built by the Defoe Boat & Motor Works, Bay City, Michigan, for the Moran Towing and Transportation Company, Inc., America's oldest and largest towing concern. Both boats are GM Diesel powered for propulsion and auxiliary service. They will be used on both inland and ocean service.



L MOTORS

E DIVISION • Cleveland, Ohio

Advance News

OF A NEW ADVANCE IN TOWBOAT POWER!

RECENTLY launched, the THOMAS E. MORAN and her twin-ship, WILLIAM J. MORAN, introduce several new, highly important advances that mark a big step forward in the application of the Diesel-Electric Drive to workboats.

Each of these new vessels is powered with two 8-cylinder, 675 H.P. GM Diesels that conspicuously demonstrate the extent to which the GM 2-cycle principle makes it possible to meet the most exacting limitations on engine weight, size and operating cost.

What is more, the complete installations, engineered in accordance with the recommendations of General Motors marine engineers, provide for a greater flexibility in operating speeds than has been customary heretofore. This has been achieved by an entirely new reduction gear set-up that permits the use of light-weight, high-speed propulsion motors which drive the propellers from half-speed through seven steps up to full engine speed.

Here is a notable example of General Motors' progressive strides in making the Diesel-Electric Drive more adaptable to boats of every type and purpose—of the outstanding ability of the GM Diesel engine to meet the most unusual demands for lower operating costs and improved performance under the toughest service conditions.

Bring your power problems to GM. Learn what GM Diesel Power can do to make your vessels cheaper to operate and maintain, more useful and more profitable to you. As you can see, in panel at right, the advantages of GM Diesel Power are available to practically all heavy marine craft.

For All Marine Uses
GM DIESELS
★ Single units—15 to 1200 horsepower ★ Multiple units—any required capacity

Sales Corporation

STOPS VALVE STICKING
ON COMPRESSOR
• VALVE CLEANING was a weekly job on the compressor in a central state foundry. The plant engineer had experimented with various oils but none relieved the trouble. When the Standard lubricating salesman offered the services of a Lubrication Engineer, the plant engineer accepted, but he was practically convinced that nothing could be done.
The Standard Lubrication Engineer first analyzed a sample of the deposit on the valves. It proved to be a mixture of core sand, oil and asphalt. The compressor was flushed with a soap solution and the intercooler blown down. With the system thoroughly cleaned, Stanoil No. 25 was put into the lubricator. Much to the plant engineer's surprise, he has not had a sticking valve since then. The elimination of his former weekly valve repair bill more than pays the difference in cost of Stanoil.
It's almost certain that somewhere in your plant the higher quality of Stanoil will pay its way in reduced maintenance and lower ultimate lubricating costs. Let a Standard Lubrication Engineer point out some of these places. He'll make this analysis at no cost to you. Call him at the nearest Standard Oil (Ind.) office, or write 910 S. Michigan Avenue, Chicago, Illinois.
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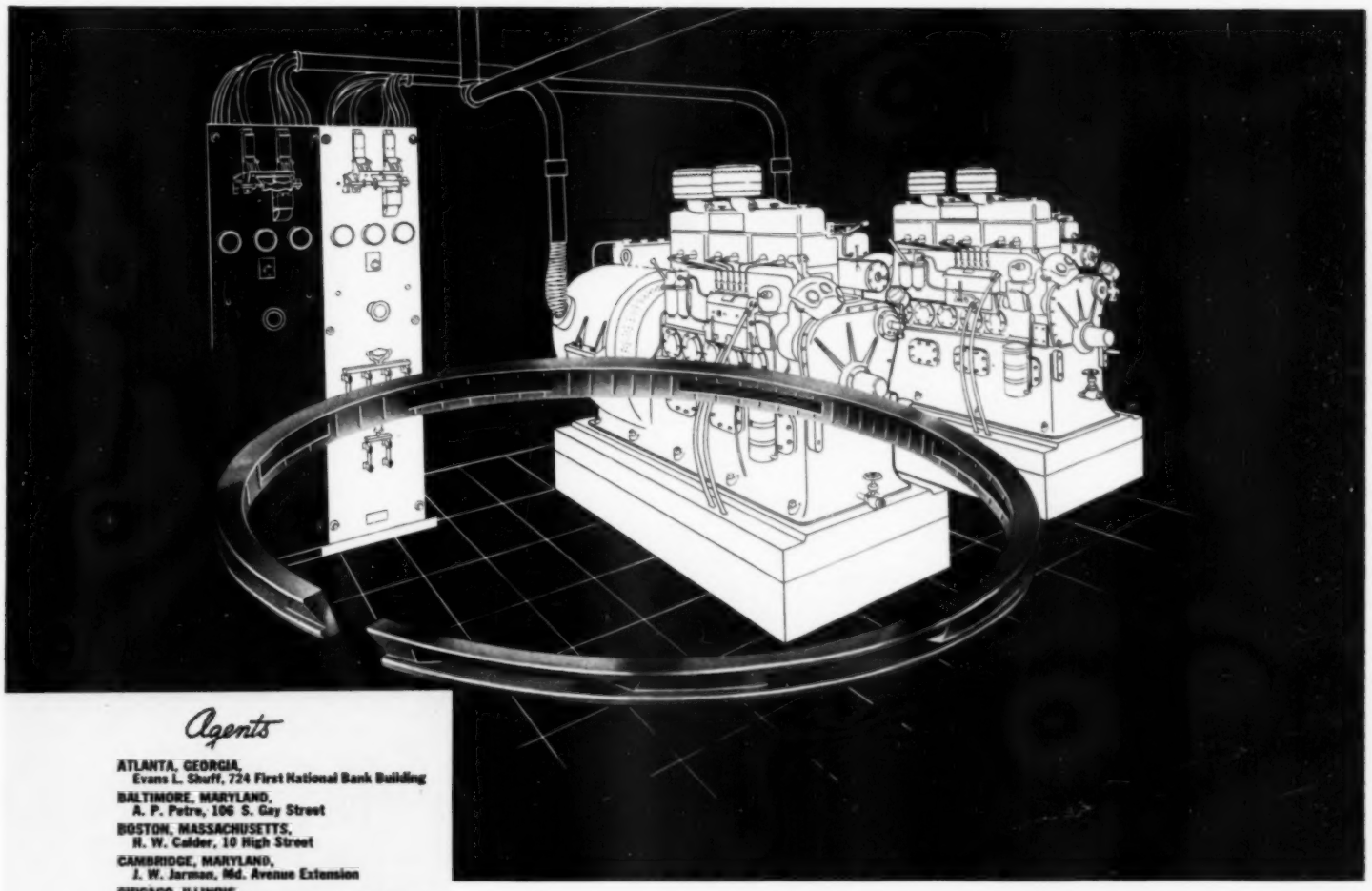
STANDARD OIL COMPANY (INDIANA)
LUBRICATION ENGINEERING
THE RIGHT LUBRICANT • PROPERLY APPLIED TO REDUCE COSTS

DIESEL PROGRESS for October, 1938. Volume IV, No. 10. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Possessions $3.00. Canada and all other countries $5.00 per year. Single copy price 25 cents in U. S. A., 50 cents for all other countries.



Agents

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Evans L. Stuff, 724 First National Bank Building

BALTIMORE, MARYLAND,
A. P. Petre, 106 S. Gay Street

BOSTON, MASSACHUSETTS,
H. W. Calder, 10 High Street

CAMBRIDGE, MARYLAND,
J. W. Jarman, Md. Avenue Extension

CHICAGO, ILLINOIS,
John H. McKenna, 1346 Washington Boulevard

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Koppers Company, American Hammered Piston Ring Div., 7310 Woodward Avenue

FORT WORTH, TEXAS,
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W. P. Cunningham, 4605 Polk Street

LONG BEACH, CALIFORNIA,
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Caimes Engineering Co., 215 Carondelet Bldg.

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F. C. Konrad, Bourse Building

PITTSBURGH, PENNA.
H. E. Passmore, 5668 Darlington Road

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ESTABLISHING NEW RECORDS WITH NEW "OIL CUTTER" RING

Drastic reductions in lubricating oil consumption are being effected by the Oil Cutter, latest type of oil control piston ring for four cycle Diesel engines. This ring has now been adopted by yet another customer . . . Superior Engine Division of The National Supply Company, Philadelphia, Pa., in their high output Diesel.

This newest American Hammered Piston Ring achievement combines eight essential features: Correct ring shape; high unit pressure; correct bevel for riding oil film; two scraping edges; simple and strong design; ample area of drainage; no ridges to collect carbon; hammered tension. Basic engineering principles are the same as those used in the Automotive oil control ring, which—in AAA Contest Board Tests—excelled the "miles-per-quart" record of three other makes of rings by 96.2%, 89.5%, and 17.7%, respectively.

American Hammered engineers have kept piston ring development continuously abreast of Diesel development. Ask about this newest ring . . . and the other late types of rings, made in every size for every purpose. Koppers Company, AMERICAN HAMMERED PISTON RING DIVISION, BALTIMORE, MD.

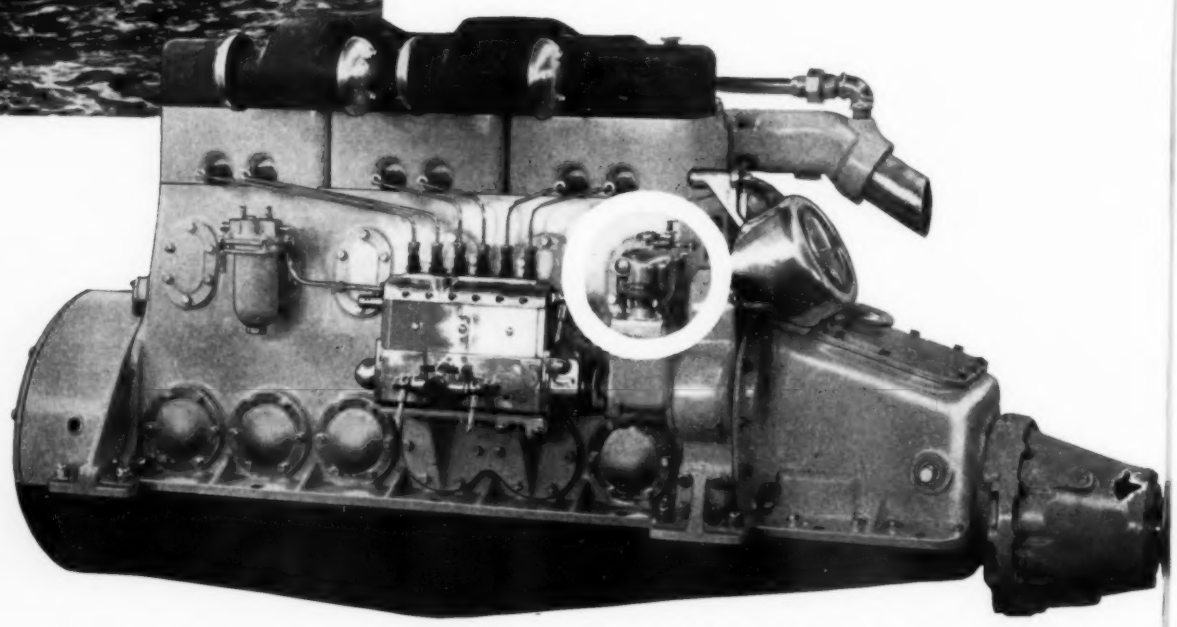
American Hammered Piston Rings

a KOPPERS product

PIERCE GOVERNORS.

THE two six cylinder 100 hp. Superior Diesels installed on the off shore fishing cruiser *Vesta* are equipped with Pierce Governors. The *Vesta* was designed and built by Hubert S. Johnson, Bay Head, N. J., for Mr. H. C. Gibson of Jenkintown, Pa., and typifies the type of yacht in which Diesel engines are now being so successfuly installed.

THE fact that Pierce Governors are installed on the two Superior Diesels in the VESTA and that Pierce Governors are standard equipment with the Superior Diesels built at their Philadelphia plant, is just but another instance where performance counts. Just another example of the general trend amongst Diesel engine builders to standardize on Pierce Governors. Pierce Governors are designed to meet the particular requirements of each Diesel engine builder. Being of the centrifugal (flyball) type, they respond instantly to each change in engine load and maintain a uniform speed.



Pierce Governor installed on six-cylinder 100 hp. Model MRA-6 Superior Diesel Engine.

THE PIERCE GOVERNOR COMPANY

1600 OHIO AVENUE, ANDERSON, IND.

PIERCE GOVERNORS
STANDARD SINCE 1913

For Dependable Performance—Choose Pierce

They don't just say,

"Gimme some Aluminum"

Constant research has made it possible to produce intricate pieces like this Alcoa Aluminum casting

The Diesel designer considers carefully what function each part of his engine is to perform. Perhaps he must save weight, guard against corrosion, boost horsepower without increasing the engine size, provide rapid heat distribution; for many parts, he'll find that Aluminum best meets the requirements. Then he calls in the Alcoa engineer.

Exhaustive laboratory tests have established what each of the many Alcoa Aluminum Alloys will do. Thus, an alloy offering the combination of properties best suited to each use is selected. This care in selecting the metal, plus the manufacturer's skill in fabricating it, accounts for the excellent service you get from every Aluminum part in your Diesel engine.

But our interest doesn't end there. We want to know that the Aluminum parts in Diesel engines going into new and untried fields are giving satisfaction. Our engineers get the facts by personally observing the performance of these engines. Expensive information to collect, of course, but it enables us to help you use Aluminum to attain greater economy and reliability, longer engine life and lower maintenance.

Aluminum Company of America, 2141 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA · ALUMINUM

SMOOTH POWER for New York Harbor

★

ELECTRIC POWER Turns the Screws of the Two New MORAN TUGS

ON each of the new 1000-hp tugs of the Moran Transportation and Towing Company, the output of the General Motors diesel engines is transmitted smoothly and surely through General Electric generators and motors to the reduction gears on the propeller shaft.

Electric drive provides outstanding advantages for tug-boat service—absence of shocks and jerks, maximum power at all speeds, exceptional maneuverability, and quick and accurate control. These advantages are of special importance because these tugs operate not only in New York Harbor, but also on the high seas and on the New York State Barge Canal. In all three places smoothness and flexibility of operation are very important.

In this engine-room view of the THOMAS E. MORAN, the two G-E 500-hp motors are in the foreground. In the background, two G-E 24-kw auxiliary generators are mounted directly above the G-E 400-kw main generators

It is significant that this important towing company selected diesel-electric drive, and General Electric is glad that it could participate in this outstanding new installation. Since 1922, G-E electric drive has been installed on tankers, cargo ships, tugs, fireboats, dredges, yachts, and many other ships. This varied experience enables General Electric to provide proved electric equipment for your new diesel-electric installations. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

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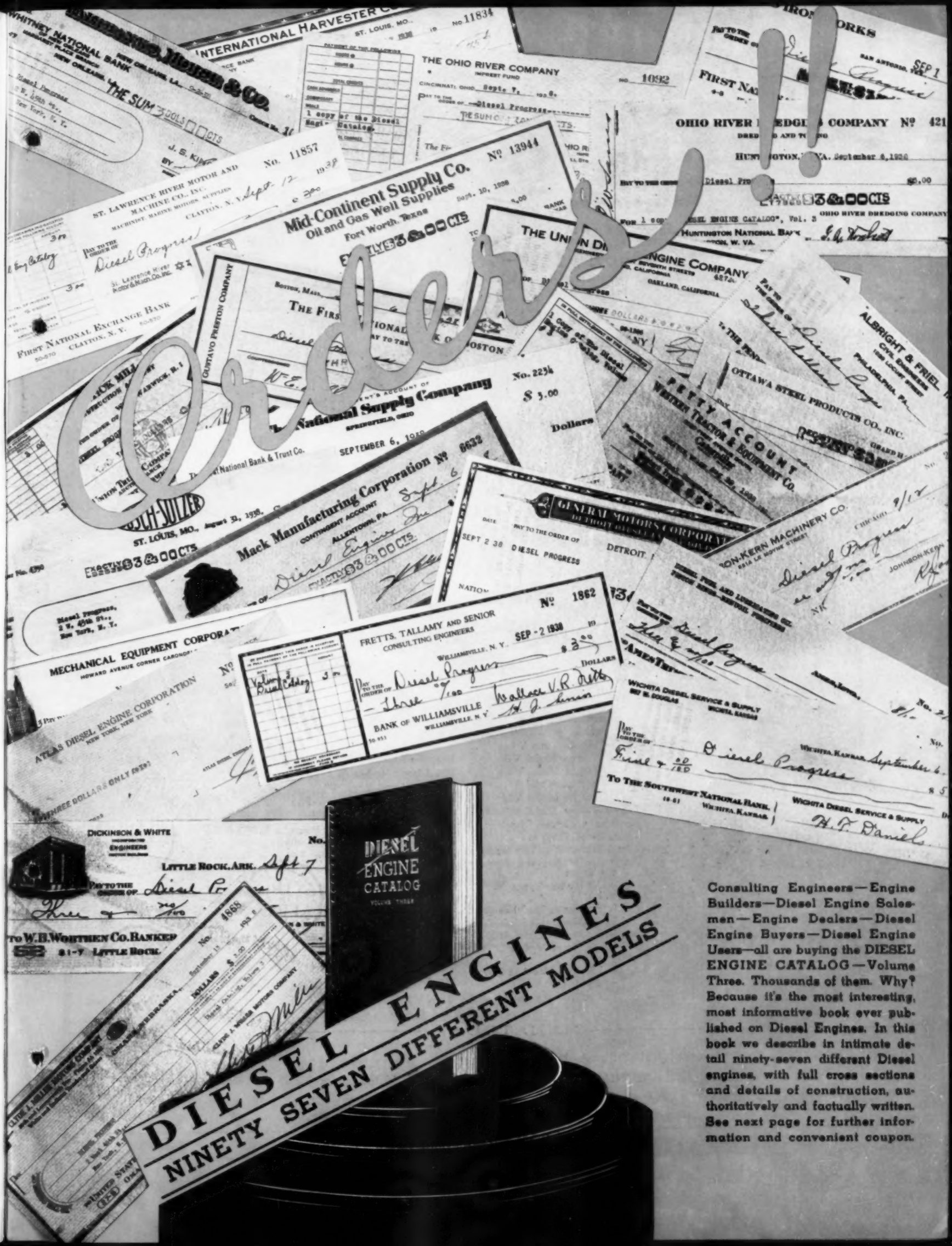

Consulting Engineers—Engine Builders—Diesel Engine Salesmen—Engine Dealers—Diesel Engine Buyers—Diesel Engine Users—all are buying the DIESEL ENGINE CATALOG—Volume Three. Thousands of them. Why? Because it's the most interesting, most informative book ever published on Diesel Engines. In this book we describe in intimate detail ninety-seven different Diesel engines, with full cross sections and details of construction, authoritatively and factually written. See next page for further information and convenient coupon.

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288 Pages—10¼″ x 13½″—704 Illustrations

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THE DIESEL ENGINE CATALOG

THIS new book on Diesel engines is entirely different from any other book published on the subject. In this new book ninety-seven Diesel engines are described in detail, illustrated in color and in full section.

B. J. Von Bongart, author of the new book "Diesel Engines," and technical editor of DIESEL PROGRESS, one of the most experienced and best known engineers in the Diesel industry, has described in intimate detail these ninety-seven Diesel engines. In this book he goes into the matter of individual design, discusses the features of design of each engine in clear cut, thoroughly understandable manner and makes it possible for the reader to grasp readily and quickly the difference between the various makes and types of engines now available on the market. He makes it possible to select from these ninety-seven different models the one engine fitted to the job in mind.

Beautifully illustrated in color, with sectional drawings visualizing with complete clarity the design features of each engine, this new book brings you under one cover a marvelously clear picture of the engines now available. Right up to the minute, as modern as tomorrow, printed on a big page size (10¼″ x 13½″) to make the illustrations readable, this new book is indispensable to the Consulting Engineer, Diesel Salesman, prospective Diesel engine buyer—yet the price is but $3.00 postpaid.

We offer you this new book, believing it to be the finest book of its type ever produced, authoritative, informative, beautifully printed and bound—a book you will be proud to own, a book from which you will obtain much useful information. May we hope you will use the coupon hereunder today—now?

Diesel Engines Described

Alco Four Cycle Stationary
Alco Locomotive Type
Alco-Sulzer Types "T" and "TM"
Alfa Romeo 2-cycle Automotive Engines
Allis-Chalmers Oil Engines
Atlas Imperial Stationary and Marine Diesels
Ball-Muncie Vertical and Horizontal Engines
Bristol "Phoenix" Diesel
Buckeye Heavy Duty Type Diesel
Buda-Lanova Automotive and Marine Diesels
Busch-Sulzer Bros. 2-cycle
Busch-Sulzer Bros. 4-cycle
Caterpillar Industrial Engines
Caterpillar Marine Engines
Chicago Pneumatic Model 8-CP
Chicago Pneumatic Type RHB
Chicago Pneumatic Type RHB-100
Clerget Aviation Diesel
Coatalen Aviation Diesel
Cooper-Bessemer Type EN
Cooper-Bessemer Type GN
Cooper-Bessemer Type JTB
Covic Industrial, Marine and Automotive Diesels
Cummins
De La Vergne Type VA
De La Vergne Model VB
De La Vergne Model VE
De La Vergne Model VG
De La Vergne Model VM
De La Vergne Model VO
Deschamps Aircraft Diesel
Deutz Diesel Engines
Diesel Marine Auxiliary Units
Enterprise Marine and Stationary Types
Fairbanks-Morse, Types 33 and 37
Fairbanks-Morse, Model 36-A
Fairbanks-Morse Model 36-A-8
Fairbanks-Morse Model 42-E
Fairbanks-Morse Models 32 and 35
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General Motors Model 567 2-cycle Engines
Gray Marine Diesels
Guiberson Aviation Diesel
Hall-Scott "Chieftain"
Hamilton-M.A.N. Double Acting Engines
Hercules Automotive Diesels
Hill Diesels Models A, B, and C
Ingersoll Rand Type "S"
International Harvester—Four and Six Cylinder Types
Junkers Jumo 205 Diesel
Kahlenberg Marine and Stationary Engines
B. M. W. Lanova Aviation Diesel
Lister Small Stationary Diesels
Lorimer Slow-Speed Heavy-Duty Diesels
Murphy MD Series
Napier Culverin Diesel
Nordberg 4-cycle
Nordberg 2-cycle
Northeastern Diesel Engines
Power Manufacturing Company
Ruston-Hornsby—Horizontals
Sterling Crankless Diesel Engines
Stover Single Cylinder Diesel
Superior Model "A"
Superior Model "D"
Superior Type M
Superior Type S
Thornburg High-Speed Diesel Engines
Venn-Severin Model "D" Type "M"
Victor Horizontal Type
Waukesha—Hesselman Type
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Enter my order for a copy of the DIESEL ENGINE CATALOG, Volume Three, for which I enclose $3.00—it being understood that shipment will be made postage prepaid.

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please print name and address

ARROYO SECO GOLD DREDGING CO., *Powers Dredge with* ATLAS DIESEL

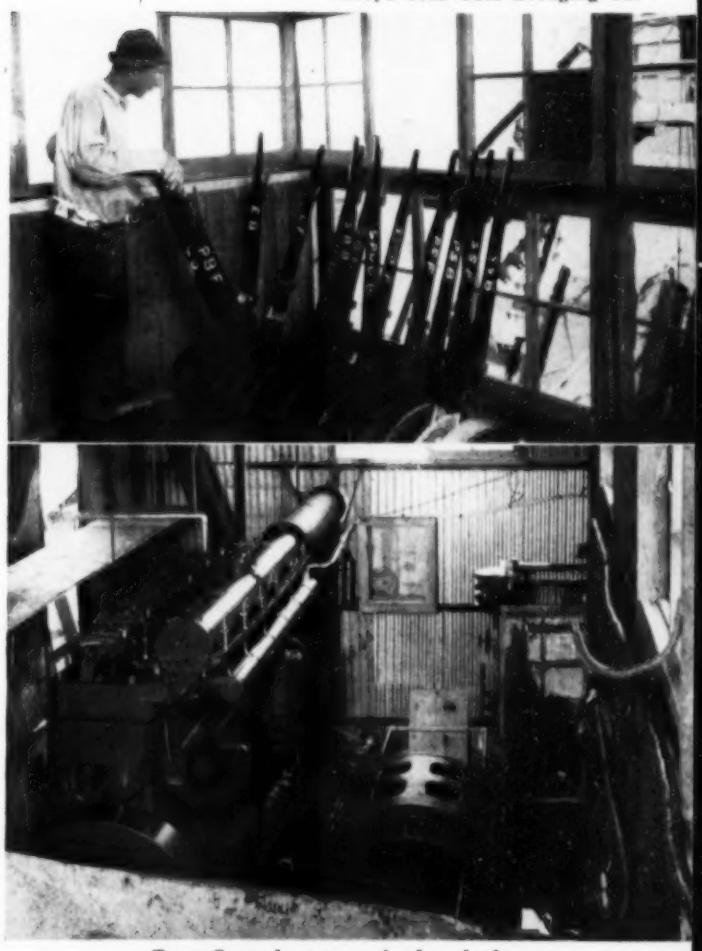
Harry C. Smith, Superintendent Arroyo Seco Gold Dredging Co.

THE ARROYO SECO GOLD DREDGING CO. has for a few years operated two gold dredges near Ione, California, with purchased electric power. With the acquisition of new property far off the high lines, they decided to power a 2½ cu. ft. bucket dredge with Diesel power.

They engaged the Walter W. Johnson Company, prominent San Francisco dredge building engineers, to design and reconstruct the new Diesel electric dredge. Because of their satisfactory experience with ten Atlas Diesels previously specified for gold dredges, they chose a 6-cylinder, 9″ x 10½″ enclosed type Atlas Diesel which develops 200 hp. at 514 rpm. This engine drives a 125 kw. alternating current generator with direct connected exciter at 900 rpm. by means of a Texrope drive.

During the first 95 days of operation, the dredge dug a total of 154,935 cubic yards to a depth of between six and seven feet in ground that was particularly tough going. This is an average of 1,631 yards per day. This property is being worked on three 8-hour shifts with a 20-minute shutdown each day for oiling, during which the engine continues to operate. The engine is stopped but one hour each week for changing lubricating oil.

The cooling system is of the closed circuit type. Pipe coils are suspended on the outside of the dredge and cooled by the water in the pond. Soft water is circulated through the coils and engine by a V-belt driven centrifugal pump. The cooling system is provided with the necessary surge tank and by-pass valves to vary the amount of cooling surface in use. Altogether this dredge represents the last word in design for economical and dependable motive power.



Top—Control room of the dredge.
Bottom—Partial view of engine room.

ATLAS IMPERIAL DIESEL ENGINE COMPANY

Eastern Division
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Central Division
228 NO. LASALLE ST., CHICAGO, ILLINOIS

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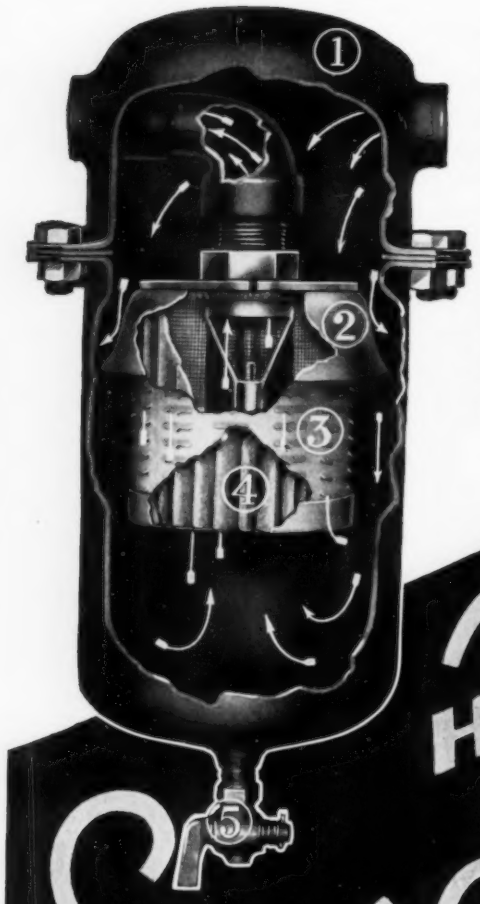


← MODEL CPH

for horizontal air transmission lines. Model CP for vertical lines. (1) container; (2) baffle; (3) housing; (4) insert; (5) drain cock.

MODEL DS →

Combination Silencer-filter for internal combustion engine and compressor intake. (A) Rectifying chamber (a series); (B) dry Feltex Filtering Medium; (C) Radial Fin Construction; (D) rigid, galvanized mesh frame; (E) reinforcing tube.

HOW TO Save Money

WITH AIR FILTERS » » » Check

over the machinery and processes under your supervision. Are Diesel, gas or gasoline engines, compressors, blowers or electric motors operating without efficient air filters? Do air-powered tools run on unfiltered air? Are air-using processes lacking clean, dry air? Is intricate, expensive machinery unprotected from dust?

AIR FILTERS ARE ECONOMIZERS

In every case, correct air filter installations will reduce operating expenses and maintenance costs. The reasons are simple. Abrasive dust is everywhere. Unless kept out by efficient filters, it scours away cylinder walls, wears out reciprocating parts, clogs delicate machinery. Foreign matter in air transmission lines (pipe scale, rust, dirt, oil and moisture) damages air-using tools; interferes with air-using processes. Facts and figures prove the savings made by high grade air filters. Use them everywhere and watch cost figures drop.

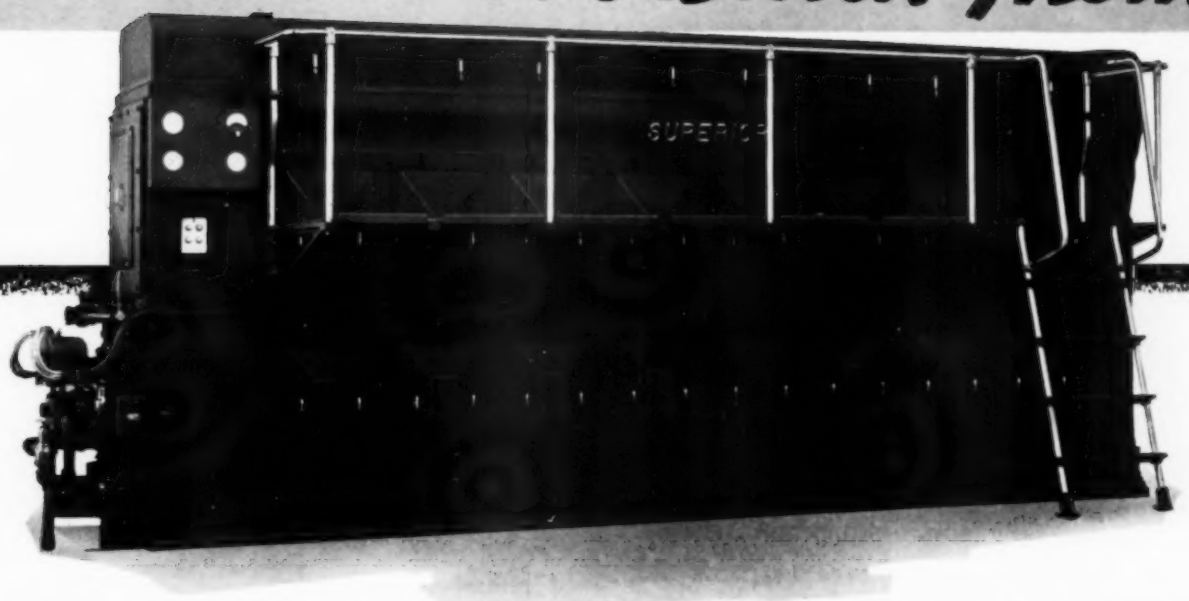
Protectomotor
Air Filters 99.9% Efficient

Tests made by the University of California prove that Protectomotors possess an efficiency only .1% less than absolute. This extraordinary performance is the result of several factors: (1) the patented Radial Fin Construction provides large filtering area in small space, minimum restriction of air flow, (2) the famous Feltex Filtering Medium is tough, long wearing, efficient in stopping the finest dust particles, (3) Protectomotors are built under the closest possible supervision from high quality, selected materials. Same factors give super-efficiency to Protectomotor Lubricating Oil Filters. You can SAVE MONEY using Protectomotors —write for catalog and data.

Air Filter PROTECTOMOTOR AIR FILTERS *Headquarters*

STAYNEW FILTER CORP., 12 Leighton Ave., Rochester, N. Y.

YES! *We Build Them*



CONVERTIBLE ENGINES!

YES! WE BUILD THEM . . .

For years most engines built by the Superior Engine Division of THE NATIONAL SUPPLY COMPANY have been convertible engines—convertible from gas to Diesel—or convertible from Diesel to gas.

These engines are of increasing current interest to sewage disposal plants or industrial and municipal plants in regions where a stable supply of natural gas now exists at favorable prices.

For but little more cost, be sure to specify a convertible engine and be prepared for developments affecting either fuel supply.

For maximum value and satisfaction, specify Superiors!

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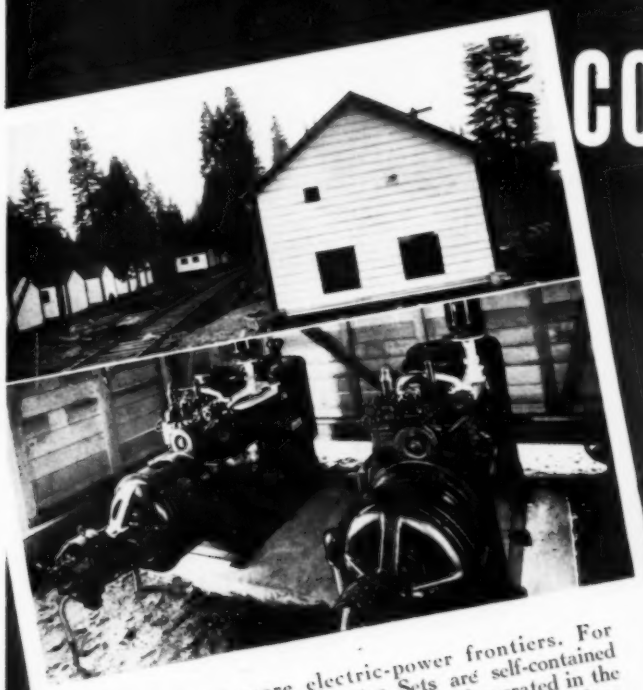

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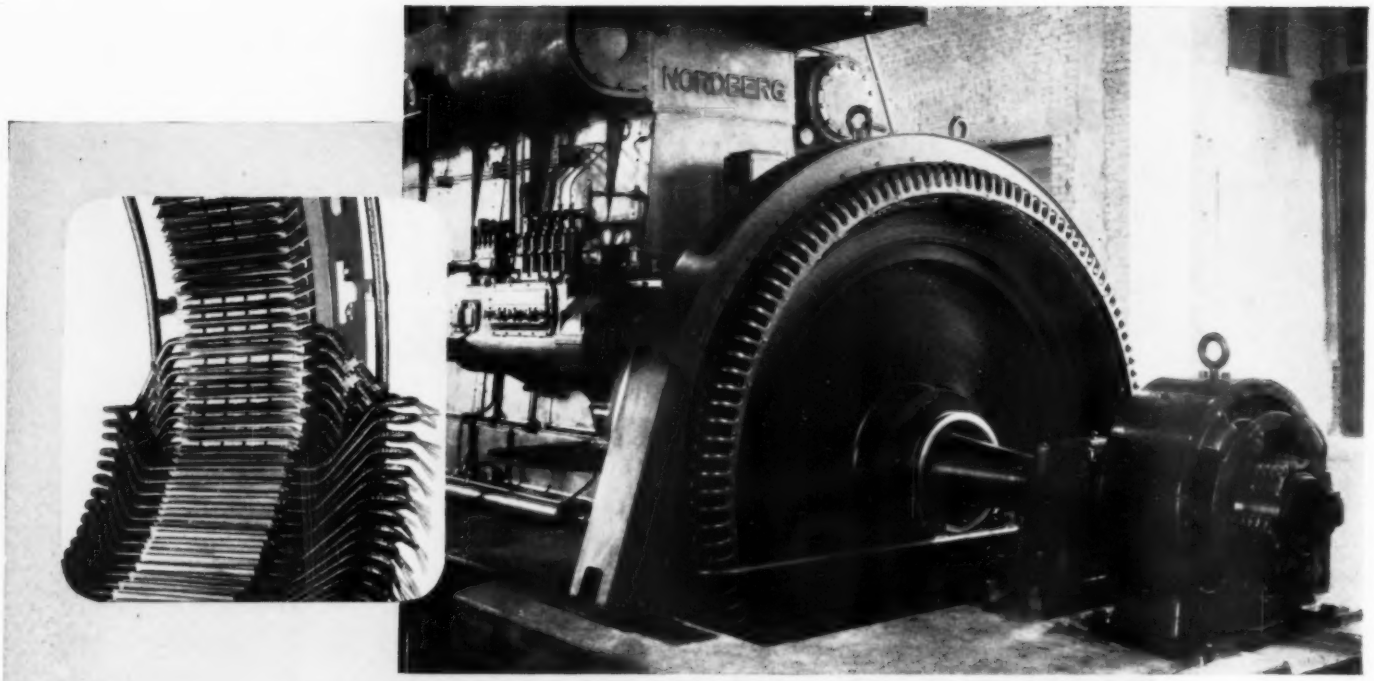

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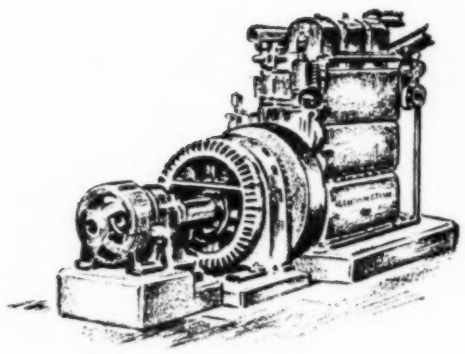

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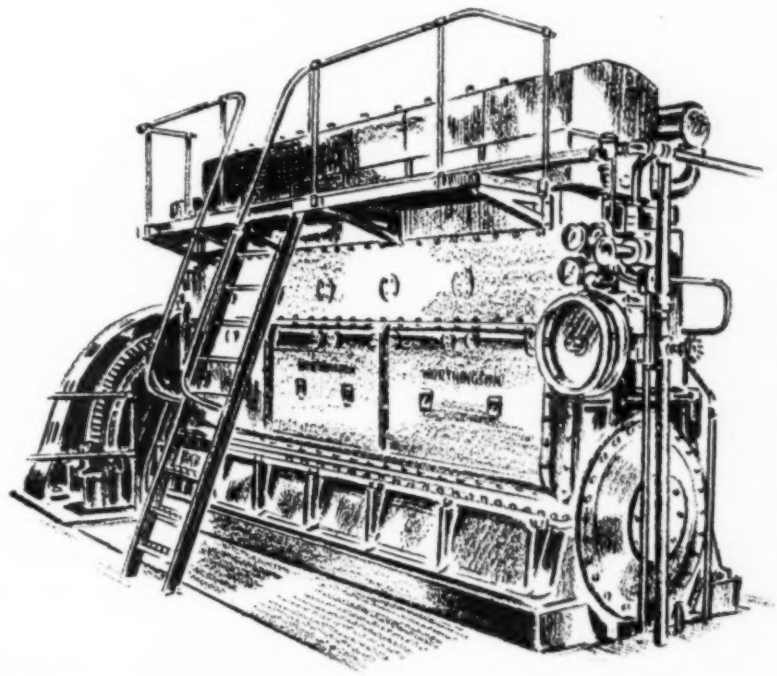

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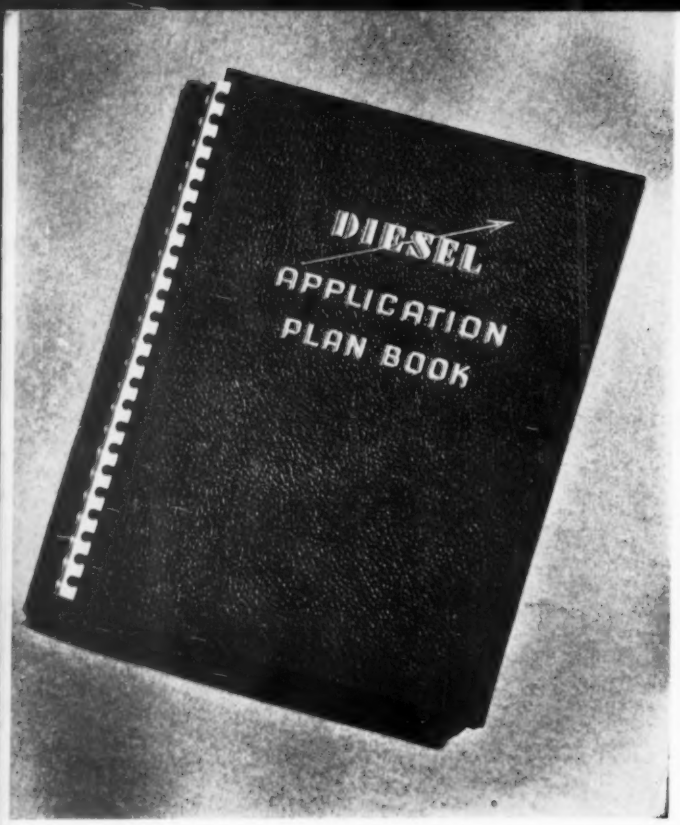

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5 Intake and Exhaust Systems
6 Stationary Installation Check List
7 Engine Driven Cotton Gin Check List
8 Commercial Ice Plant Check List
9 Engine Driven Pumping Plant Check List
10 Marine Diesel Engine Installation Data
11 1340 kw. Municipal Power Plant and Water Works
12 Printing House Power Plant
13 Three Unit Generator Drive
14 120 ft. Twin Screw Yacht
15 Forging Company Power Plant
16 Small Two Unit Power Plant
17 Drive for Feed Grinders
18 Feed Grinder and Blower Drive
19 Rubber Stamp Manufacturer
20 2500 kw. Municipal Power Plant
21 Alternative Municipal Power Plant Station Without Basement
22 Pumping Unit for Irrigation Purposes
23 600 hp. Tug
24 1500 kw. Municipal Power Plant
25 Skyscraper Power Plant
26 2000 kw. Municipal Power Plant
27 130 ft. Twin Screw Yacht
28 Creamery Power Plant
29 Diesel Electric Pumping Station
30 Country Residence Power Plant
31 Deep Well Pump Plant
32 279 ft. Twin Screw Yacht
33 1500 hp. Diesel Electric Marine Drive
34 Two Unit 15 kw. Country Residence Power Plant
35 Stove Manufacturing Power Plant
36 Drive for Centrifugal Compressor
37 Plantation Power Plant
38 Belt Drive for Generators
39 Mine Power Plant
40 7100 kw. Municipal Power Plant
41 Hp. Reduction Gear Tug
42 Portable Diesel Driven Compressor Unit
43 Three Unit Country Residence Power Plant
44 Belt Drive for Slow Speed Compressor
45 Belt Driven Generators
46 65 ft. Twin Screw Yacht
47 3 kw. Country Residence Power Plant
48 21,000 bbl. Canal Type Tanker
49 235 hp. Tug
50 Deep Well Pump Drive
51 3½ kw. Country Residence Power Plant
52 Outboard Drive for Tanker
53 Diesel Electric Side Wheel Ship
54 Department Store Power Plant
55 Self-Propelling Pipe Line Dredge
56 Instrument Manufacturer's Power Plant
57 Tanker Cargo Pumps
58 1455 kw. Municipal Power and Water Works Plant
59 150 hp. Tug
60 42,000 kw. Municipal Power Plant
61 Sewage Pumping Plant
62 Restaurant Power Plant
63 Fast Coastwise Passenger Ship
64 5700 kw. Power Plant
65 Pilot House Control by Mechanical Means
66 Diesel Driven Tender
67 117 ft. Survey Boat
68 Municipal Hydro and 1890 kw. Diesel Plant
69 15,000 Ton Tanker
70 600 kw. Municipal Power Plant
71 Self-Propelling Pipe Line Dredge
72 Quarry Power Plant
73 600 kw. Municipal Power Plant
74 Hopper Type Dredge
75 Auxiliary Set Assemblies
76 Laundry Power Plant
77 Cotton Oil Mill Power Plant
78 1000 hp. Tunnel Stern River Towboat
79 1700 kw. Municipal Power Plant
80 Pipe Line Dredge
81 Marine Remote Controls
82 Sewage Pumping Station
83 450 kw. Floating Power Plant
84 Purse Seine Boat
85 1800 hp. Flour Mill Power Plant
86 3000 kw. Municipal Power Plant
87 149 ft. Ferry
88 Six-Wheeled Bus
89 State Park Power Plant
90 Resort Hotel Power Plant
91 700 hp. Tunnel Stern Tug
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105 Semi-Portable Compressor Unit
106 Tropical Aviation Station
107 2000 hp. Locomotive
108 300 hp. Locomotive
109 FT Diesel Electric Ferry
110 Swimming Pool Pumping Plant
111 Cold Storage Warehouse Power Plant
112 Gold Mine Power Plant
113 Dredging Pump Drive
114 Radio Shielding
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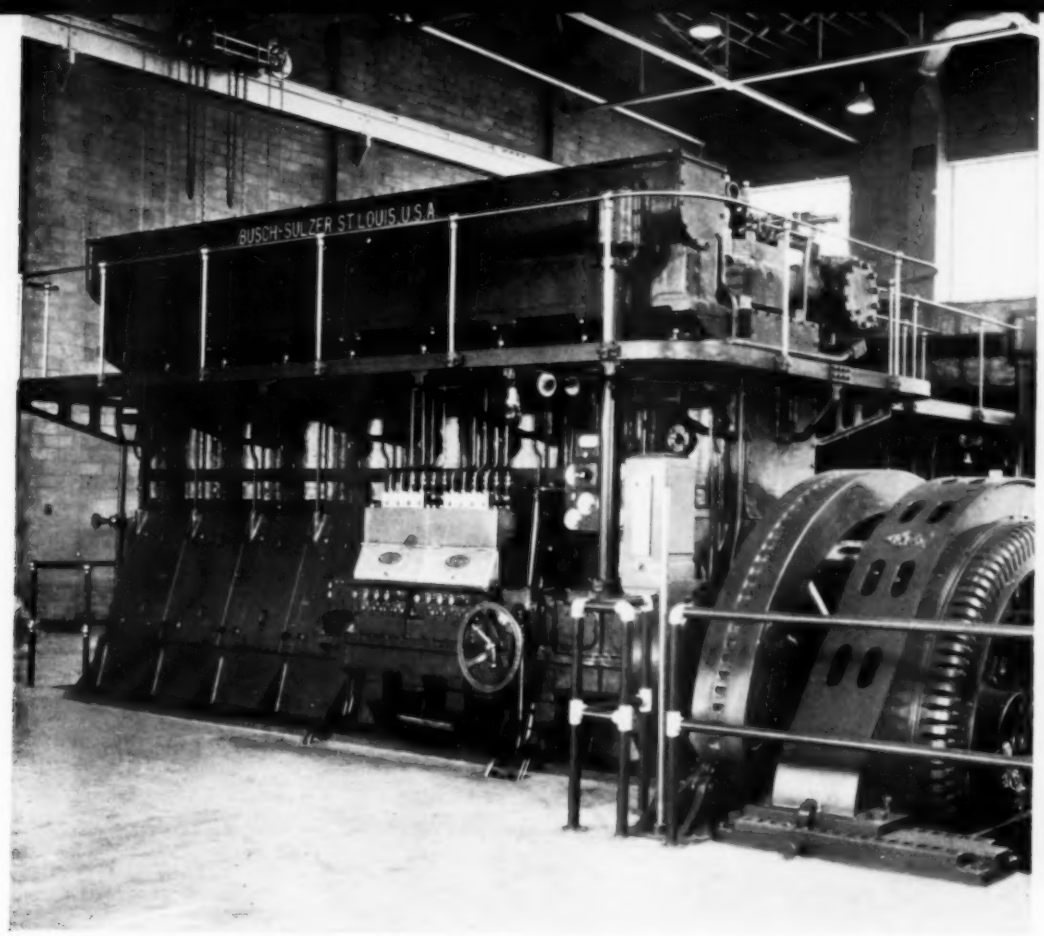

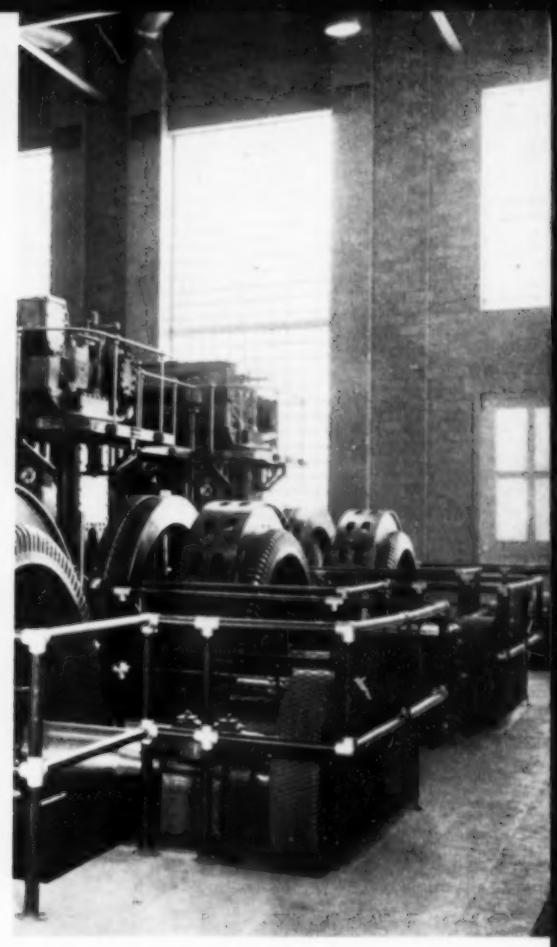

The three 1000 h.p. eight cylinder engines, installed by Busch-Sulzer Bros. Diesel Engine Company for the Wisconsin Power Co-Operative, are equipped with Erie crankshafts.

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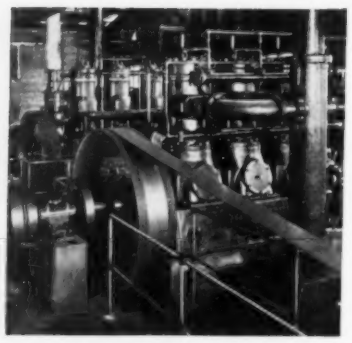
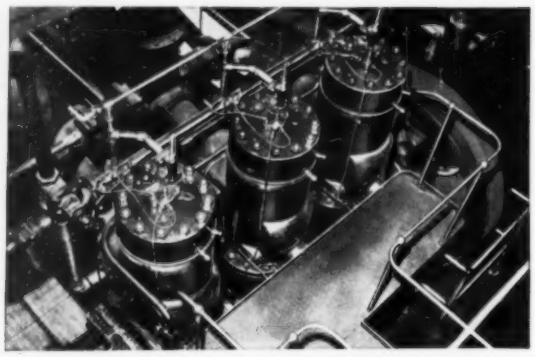


These two 190 h.p. Fairbanks-Morse Diesels and one 120 h.p. engine continue in service efficiently year after year with a very minimum of attention. For this, Texaco Algol Oil is given much credit.

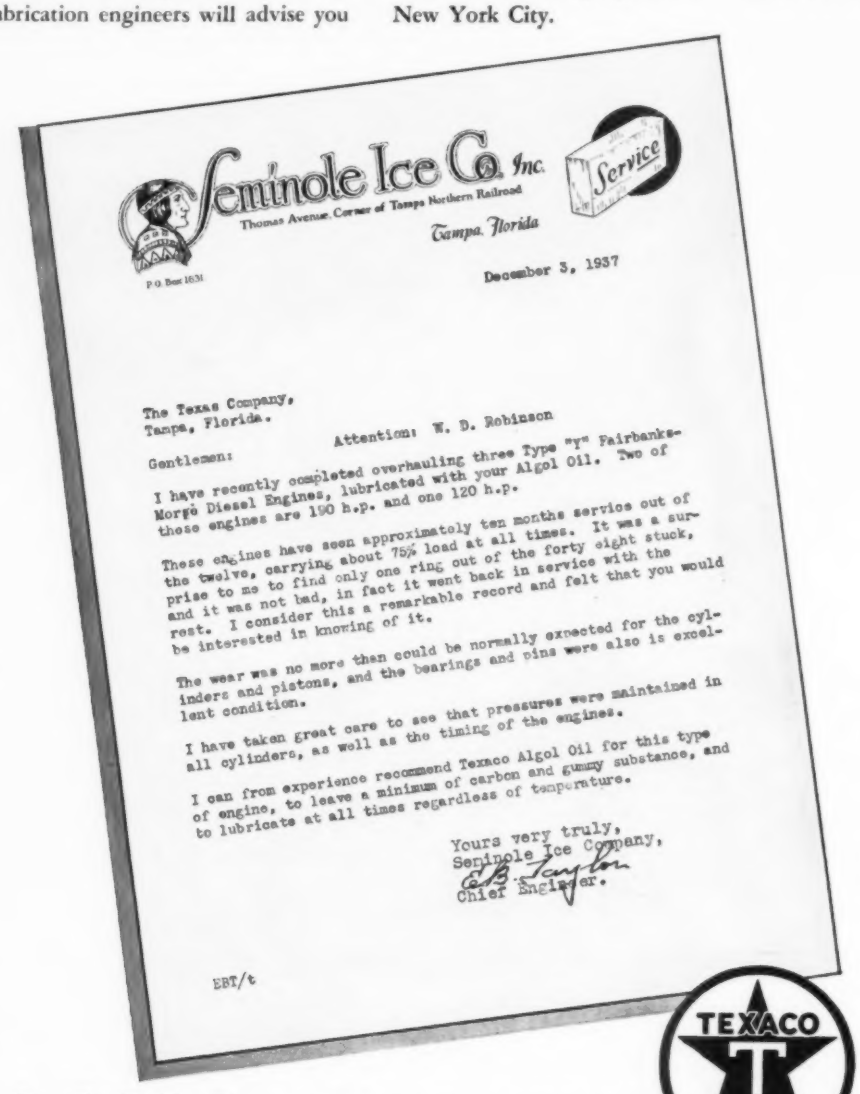


Cylinders and pistons are clean at the Seminole Ice Plant, free from blow-by and carbon deposits, rings active in their grooves.

Loading platform of Seminole Ice Plant, Tampa, Florida. Their 3 Diesels are lubricated with Texaco Algol Oil.

Chief Engineer E. B. Taylor of Seminole Ice Company, Inc., Tampa, Florida, finds his Diesels in excellent shape after 8 years hard continuous service. He's used Texaco Algol Oil since 1930.

Trained lubrication engineers will advise you on the selection of Texaco Diesel Lubricants. Get in touch with the nearest of 2186 Texaco warehouses throughout the United States, or write: The Texas Company, 135 East 42nd Street, New York City.



Seminole Ice Co. Inc.
Thomas Avenue, Corner of Tampa Northern Railroad
Tampa, Florida
P.O. Box 1631

Service

December 3, 1937

The Texas Company,
Tampa, Florida.

Attention: W. D. Robinson

Gentlemen:

I have recently completed overhauling three Type "s" Fairbanks-Morse Diesel Engines, lubricated with your Algol Oil. Two of these engines are 190 h.p. and one 120 h.p.

These engines have seen approximately ten months service out of the twelve, carrying about 75% load at all times. It was a surprise to me to find only one ring out of the forty eight stuck, and it was not bad, in fact it went back in service with the rest. I consider this a remarkable record and felt that you would be interested in knowing of it.

The wear was no more than could be normally expected for the cylinders and pistons, and the bearings and pins were also is excellent condition.

I have taken great care to see that pressures were maintained in all cylinders, as well as the timing of the engines.

I can from experience recommend Texaco Algol Oil for this type of engine, to leave a minimum of carbon and gummy substance, and to lubricate at all times regardless of temperature.

Yours very truly,
Seminole Ice Company,
E B Taylor
Chief Engineer.

EBT/t

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FRONT COVER ILLUSTRATION: One of the original Burlington Zephyrs photographed in the Royal Gorge on the Denver & Rio Grande Western Railroad when it made an exhibition tour to California.

TABLE OF CONTENTS ILLUSTRATION: A Cletrac Diesel Tractor, owned by Gosney Ranch, Cucamonga, California, pulling a 6′9″ offset disc harrow with 300 lb. shield in second gear in very rocky soil at an altitude of approximately 1,500 feet. They easily double disc 15 acres per 9-hr. day using 1 gallon per hour of 5¾c Diesel fuel.

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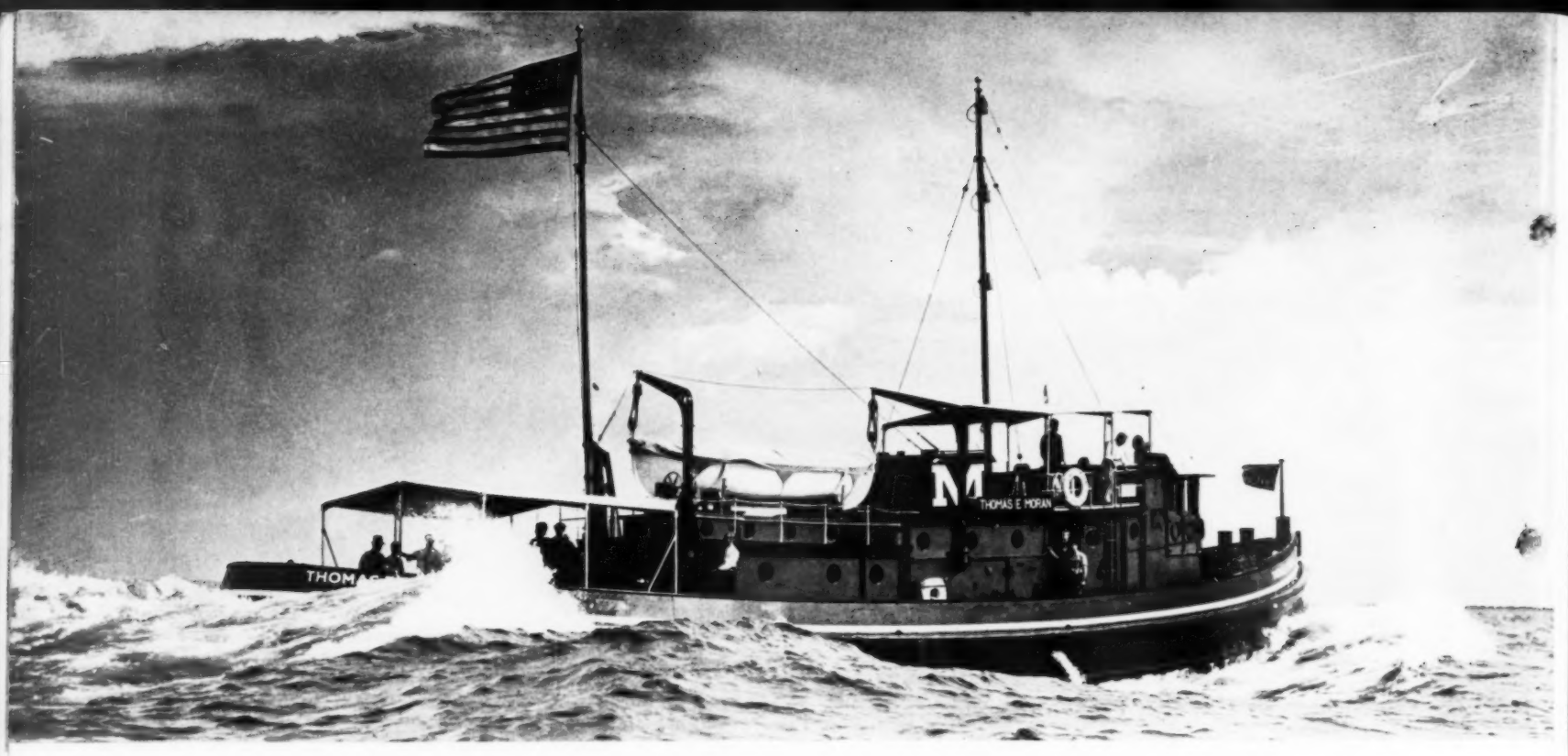
B. J. VON BONGART
Technical Editor

OCTOBER CONTENTS

	PAGE
NEW MORAN TOWBOATS	22
DIESEL BUSES IN NEW YORK	26
WATER FOR THE MOJAVE DESERT	30
REEVE, IOWA – R.E.A. PROJECT	31
ALMA F. – A NEW YACHT	34
DIESEL AVIATION	36
ORCAS ISLAND, R.E.A. PROJECT	38
TROJAN DIESEL TRUCK	41
THE *CARDINAL*, A NEW DIESEL TUG BOAT	42
DIESELS IN A DRUG STORE	44
THE *DOLOMITE 4*	46
A NEW NOZZLE TESTER	51
NEW DIESEL ORDERS	56



TWO NEW DIESEL-ELECTRIC MORAN TUGS

Powered with High Speed General Motors Diesels

TWO years ago the Moran Towing and Transportation Company, Inc., of New York, oldest and largest towing concern in the country, began to replace its steam-driven fleet of vessels, consisting of forty boats, with Diesel-engined tugs. The first vessel of the new fleet was the 89-ft. all-steel towboat *Marie S. Moran*, launched in August, 1936, and powered with a 4-cycle, 6-cylinder, 550-hp. Winton Diesel. The principal dimensions of this boat are 89 ft. by 22 ft. by 9 ft. 3 in.

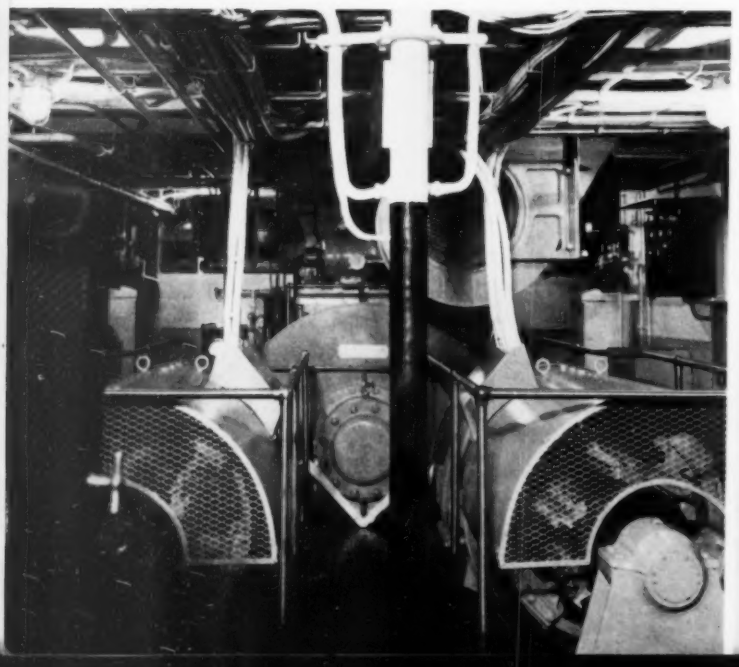
Encouraged by the reliability of the Diesel engine, the Moran Towing and Transportation Co. subsequently placed in service the *Eugenia M. Moran* and the *Elizabeth W. Moran*. These were sister ships of identical construction and layout. 94 ft. 6 in. long with a beam of 25 ft. and a 12-ft. molded depth.

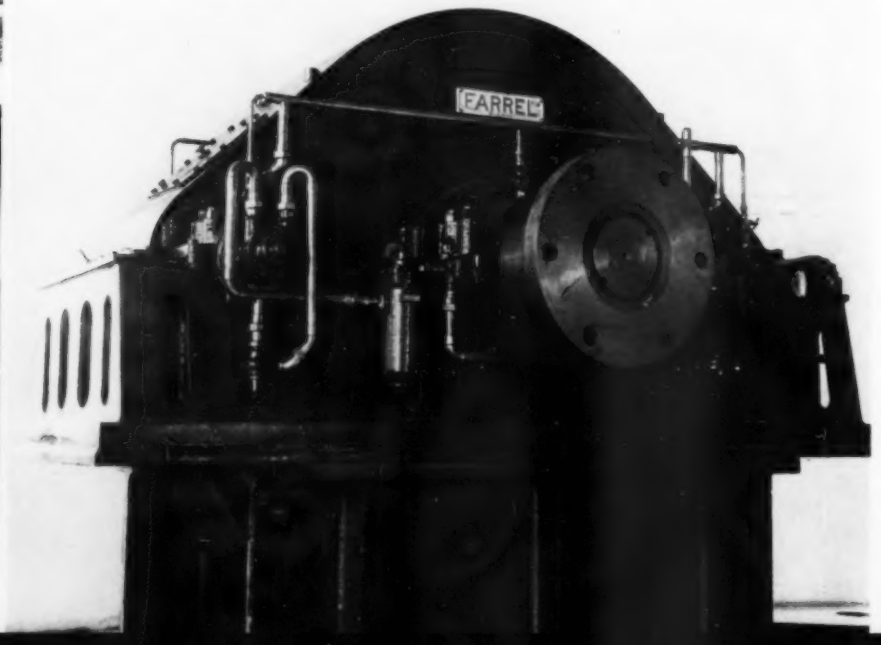
These sister ships were powered with 8-cylinder, 2-cycle Alco-Sulzer Diesel engines of 1,350 hp. at an engine speed of 250 rpm.

And so today Moran places in service two new electric driven 94-ft. twin towboats, the *Thomas E. Moran* and the *William J. Moran*, which were designed by Tams, Inc., and built by the Defoe Boat and Motor Works of Bay City, Mich. Both vessels are powered for propulsion as well as for auxiliary service with General Motors 2-cycle Diesel engines.

Since the boats are alike, the description given applies to both. The chief problem which the

Fig. 1 — General view of engine room on "Thomas E. Moran" looking aft, showing location of Farrel reduction gear and two General Electric high-speed driving motors. Right — Shop view of Farrel reduction gear.





architects had to solve was that of designing a tugboat that would be equally suited to deep-sea towing as well as for canal work. The latter limits the overhead height and at the same time the draft. The solution of the problem was to so distribute the fuel tanks that the ship could be trimmed to the lightest possible draft on an even keel, and the fuel cargo be reduced to any extent necessary so that the draft would not exceed nine feet. Masts and searchlights are portable, of course, so that they can be stowed, and the davits are designed to lower to the deck and thus meet any canal bridge clearance.

The tugs are 94 ft. 4½ in. long with a 25-ft. molded beam and a 10 to 11½-ft. draft. The total displacement is 225-325 tons. The bunker capacity is 26,000 gallons. The hull is of all-steel all-welded construction consisting of transverse frames welded to the shell with fore and aft stringers intercostal. Considerable weight was saved in the design of the hull, yet, the welding of the transverse frames directly to the shell secures a rigidity not otherwise obtainable. The utter simplicity of this type of construction results in a gain of net displacement, which is devoted to extra fuel capacity or water ballast as the case may be.

Since the tugs are intended to operate under various service demands, the adaptability of the tugs to deep-sea towing, a service of which they will experience a great deal, the hull may be fuel or water ballasted to a draft of 11½ ft., and battened down tight from end to end, still permitting the crew to move about with perfect freedom through the interior passageways. The interior arrangement is such that any operation aboard ship except the handling of deck lines can be taken care of; any compartment of the ship is accessible from any other compartment without necessity of outside passages.

The most outstanding feature of these ships, however, is probably the one-man control from no less than four distinct stations, to wit: From the pilot house, from the bridge, from the aft end of the boat and finally from the engine room proper. (See Fig. 4.) There is no engine room telegraph or signal bell. The man in charge of the ship has at his right hand as he stands at the steering wheel, a pedestal control, closely resembling in size and general shape, the regular engine room telegraph pedestal. The lever, however, gives no signal but directly controls the propeller speed forward or aft, there being 15 speed notches in either direction, and the response of the propeller is instantaneous.

The most significant feature of these new towboats are the General Motors Diesel-electric-drive marine units. (See Fig. 3.) The complete power installations were designed and engineered to meet the ideas of General Motors marine engineers. Therefore, the power plants embody new advances which, in the aggregate, present a new conception of how modern workboats of this type should be powered. To meet the weight and cost limitations, General Motors has provided an innovation which will be of particular interest to vessel owners and operators. This is a 1,000 hp. Farrel-Birmingham reduction gear placed between the propelling motors and the propellers. (See Fig. 1.) This gear permits the installation of lightweight, high-speed, propulsion motors, as well as the low maintenance cost and rugged construction necessary for hard continuous service.

Fig. 2 — Low height of propulsion units permit use of a complete deck over engine room with quarters arranged about passages that permit access to all interior compartments.

The main engines consist of two 8-cylinder General Motors 2-cycle engines embodying the uniflow system of scavenging. They are of 8½-in. bore and 10-in. stroke, delivering their rated power of 675 hp. at a speed of 750 rpm. Directly connected to them are General Electric DC generators rated at 400 kw. at 250 volts with V-belt driven exciters of 24 kw. capacity at 125 volts. These generators provide the current to operate the electric propulsion motors rated at 500 hp., 840 to 1,200 rpm.

The electric propulsion motors do not drive propellers directly but rather through reduction gears of the Farrel-Birmingham type. This unit is of the two pinion type with the pinion shaft

Fig. 3 — General view of engine room looking forward with Brown pyrometer on the post. Two General Electric generators in foreground.

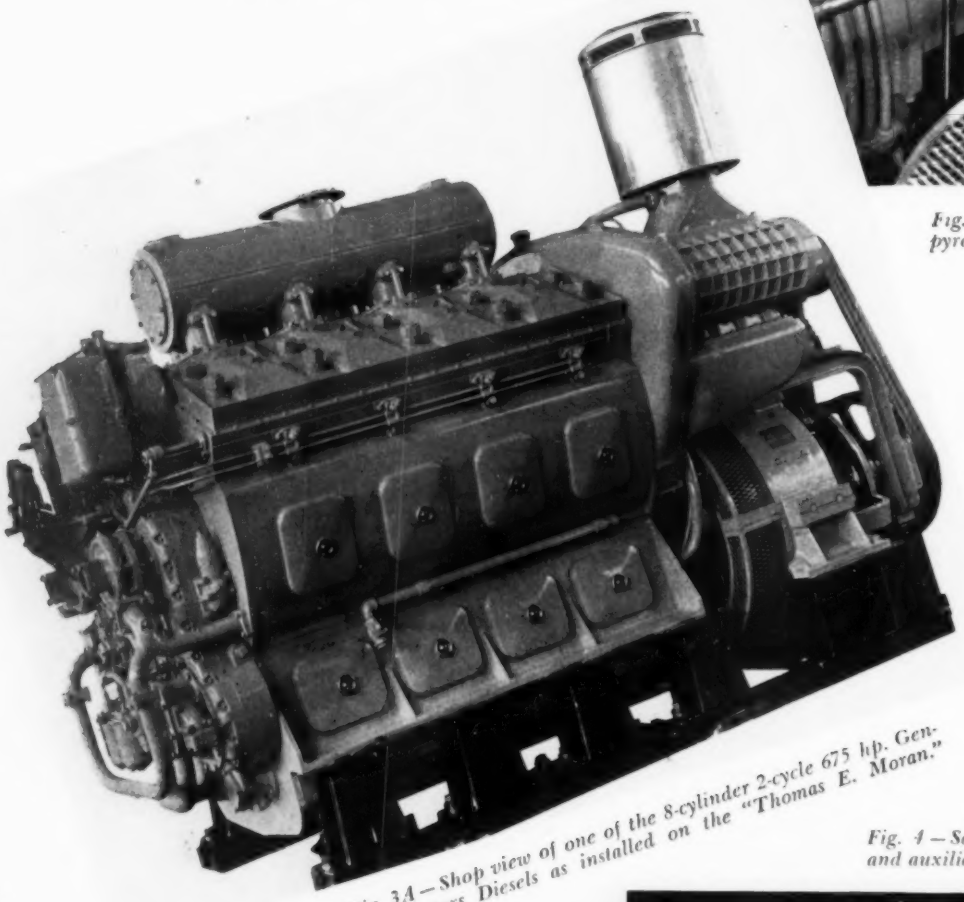
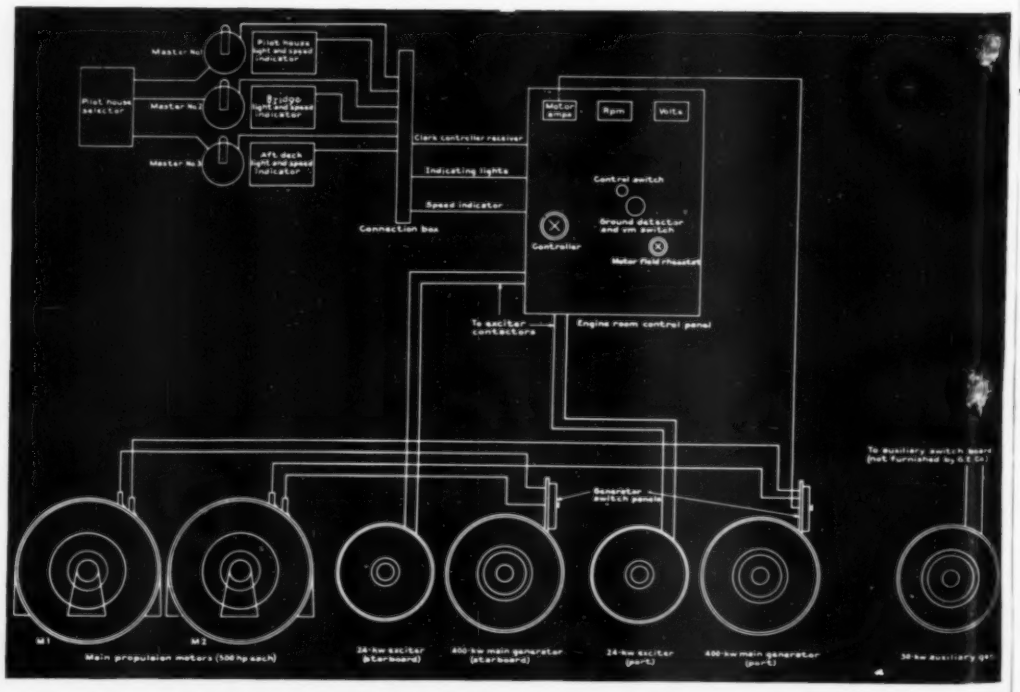


Fig. 3A — Shop view of one of the 8-cylinder 2-cycle 675 hp. General Motors Diesels as installed on the "Thomas E. Moran."

and the propeller shaft on the same horizontal line. The DC propulsion motors with a combined power output of 1,000 hp. at 1,200 rpm., drive the propeller shaft at a speed of but 200 rpm., hence with a reduction of six to one. Reducing the motor speed to 960 rpm. gives a corresponding propeller speed of 160 rpm. Since the two electric propulsion motors connect to but one reduction gear, there is but one propeller. The latter is of the three-blade type, 8 ft. 6 in. in diameter with a 6-ft. 4-in. pitch. This large propeller gives the boat a speed of 14 knots per hour with the propeller turning at the full speed of 200 rpm.

In addition to the main engines, each of the two Moran towboats is equipped with an auxiliary power plant (See Fig. 6), consisting of a 3-cylinder, 2-cycle General Motors Diesel engine delivering 45 hp. at an engine speed of 1,200 rpm. These engines, too, are of uniflow scavenging type, with a bore of 4¼ in. and a stroke of 5 in. This engine is mounted as a unit complete with a General Electric generator together with all pumps, coolers and other accessories. This engine is radiator cooled, with its radiator and water tank attached, so that this unit requires no connections except the exhaust line and thus operates independently on its foundation.

Fig. 4 — Schematic diagram of propulsion, control and auxiliary equipment furnished for each tugboat.



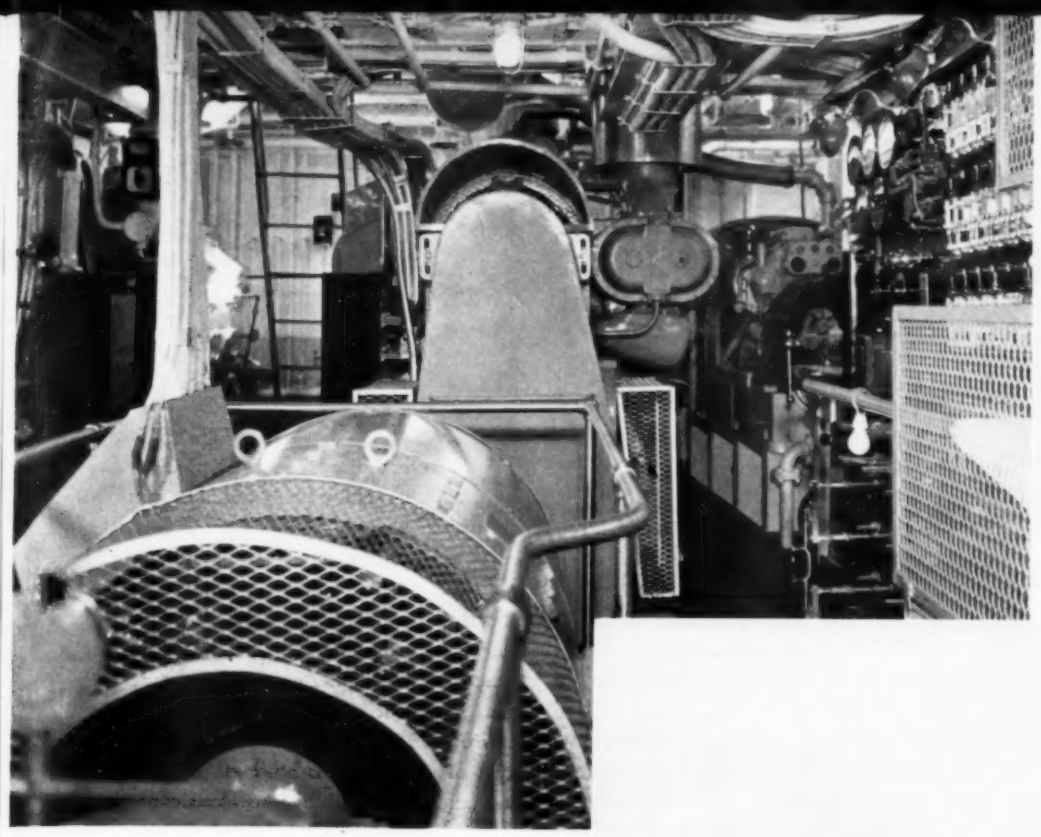


Fig. 5 — Starboard main engine with "Packaged Power" auxiliary unit beside it.

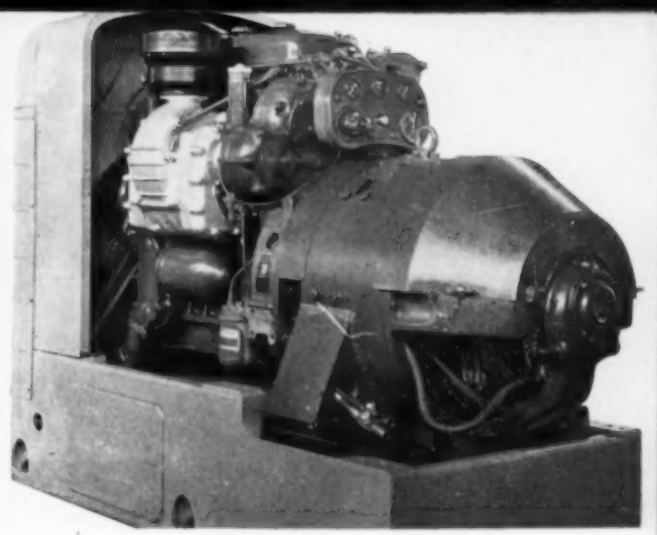


Fig. 6 — Shop view 3-cylinder General Motors "Packaged Power" auxiliary unit as installed on the two new Moran tugs.

This engine is intended for stand-by services only. As stated previously, the main generators are fitted with 24 kw. exciters, but since the field current requirements do not exceed 2½ kw., this leaves ample current for the operation of the lights as well as for the auxiliary electric motors. If, however, the main engines are at rest, the auxiliary Diesel engine may be pressed into service or it may also be used to furnish excitation current for the main generators.

A feature not usually found on Diesel-engined vessels of this size is the use of electric starting for the large main as well as for the auxiliary engine, thus eliminating air-starting and compressor units. Exide storage batteries — which may be charged from the exciters or from the auxiliary Diesel-generator set — provide the starting current. The generators of the large main engines are then used as starting motors, whereas the auxiliary Diesel engine is set in motion with the usual automobile type of starter.

The equipment used with these engines is modern and sufficiently complete to assure satisfactory performance. The engine speed is regulated by means of Woodward governors and Brown pyrometers indicate the exhaust gas temperature. The main as well as the auxiliary engines are fitted with Maxim silencers. Harrison heat exchangers are used to cool the main engines with fresh water, the sea water circulating in the heat exchangers only, not in the engines water jackets. A Purolator filters the fuel oil and Youngstown Miller Purifier reconditions the lubricating oil. The Moran Company has used one of these Youngstown Miller units very successfully in one of their older vessels, hence specified them for each of these new tugs.

Aside from the engine accessories, the boats carry modern equipment for other purposes, such as Bludworth radio direction finder, Chisholm Moore hoists and Frigidaire refrigeration machines.

In actual operation, the control of the boats is simple indeed and, as stated before, strictly one-man. Instead of running the engines at constant speed, as is customary with the usual electric drive, the engines in these new-type boats operate at half speed until the propellers reach half speed. Beyond this, higher propeller speeds are obtained by increasing the engine speed in seven steps up to full speed. This feature provides a decided decrease in operating cost, especially in service requiring less than full load operation of the engine.

The exceptional maneuverability and remote control provided by the electric drive are desirable in the service in which these vessels will be used. During the greater part of the year these boats will be used in the close waters of the Hudson River, the State Barge Canal system and the Great Lakes. During the balance of the year they will be engaged in New York Harbor service.

"DIESELS ELIMINATE AN EXHAUST NUISANCE"

By JOSEPH LANG

ON May 24, 1938, a fleet of 22 streamlined Diesel-electric buses were put into operation on the Grand Concourse, the main thoroughfare in the Borough of the Bronx, New York City, N. Y., following an inspection ceremony by Borough President James J. Lyons and representatives of the Borough's civic organizations.

These new Diesel-electric buses replaced a fleet of gasoline buses which were slightly smaller in size. For years officials of the Busfare Transportation Corp., operators of the majority of bus lines in the Bronx, had sought some means of doing away with the exceedingly obnoxious carbon monoxide fumes given off by the gasoline powered buses operating on their routes. It appears that the new Diesel-electric buses are the solution to this problem. For the Diesels give off noticeably little smoke or fumes. It is only after the engine has been idling for several minutes and then rapidly accelerated that smoke or fumes become apparent to the passerby.

This fleet of Diesel-electric buses was built by the Twin Coach Co. at Kent, Ohio. They are all of the model 41 RC DE, designed to comfortably accommodate 40 passengers, seven more than the old gasoline buses could seat.

All buses in the field are powered by Hercules Diesels, model DRXB engines. The engines have 6 cylinders 4⅜ in. bore x 5¼ in. stroke, developing 125 hp. at 2,200 rpm. The electric drives for these buses were supplied by both General Electric and Westinghouse. The generators are closely coupled to the Diesels. They are DC generators of the self-excited type, shunt wound with commutating poles. The generators are rated at 72 kw., 260 volts, 500 amp. maximum, at 1,750 rpm.

The electric propulsion motors are of the commutating pole type, two having series wound motors with a high torque suitable for a standard spiral bevel single reduction rear axle. The motors are rubber mounted on the underframing between the two channel rails underneath the floor ahead of the rear axle. A reverser switch is mounted on the motor. The lever of the switch is manually controlled from the driver's position.

The Diesel engine and the generator are also mounted on rubber in the rear of the bus, thus providing ample platform space for incoming passengers and better vision.

The Diesel engine drives the generator which supplies current for the electric motor, and which in turn acts directly on the rear wheels. The transmission consists of a forward speed, neutral, and reverse speeds.

When the lever is in the neutral position the Diesel is idling and no appreciable current flows to the electric motor. As soon as the lever is placed into the forward position and the throttle pedal is pressed down the Diesel comes up to full speed. A teaser connection to the battery insures prompt build-up of the generator. The slightly cumulative compound characteristics of the generator control the speed of the Diesel as the bus starts. The full torque of the engine is absorbed by the generator and multiplied by the electric propulsion motor in a smooth continuous flow to the rear wheels.

From a full stop, with the Diesel idling at 650 rpm., the bus can move 150 ft. in 7 seconds, 500 ft. in 21 seconds, 1,000 ft. in 29 seconds. At this time the Diesel will be turning over at 1,750 rpm. and the 9 ton bus will be traveling at 45 miles an hour. Before the order for this fleet of Diesel-electric buses were placed, the Surface Transportation Corp. operated a single bus on the Concourse route for a year test period.

Mr. W. J. Cumming, General Superintendent of the Surface Transporation Corp., has found through this year's test period that the Diesel-electric bus operating on the Concourse route produced 4.5 miles on a gallon of Diesel oil as compared to 1.9 on a gallon of gasoline by a similar sized gasoline powered bus.

These buses average 40,000 miles a year on the Concourse route. It is estimated that they will pay for themselves in 3 years. It is also estimated that they will average a 10 year life, that is, with replacement of worn out parts when necessary.

The Surface Transportation Corp. also has in operation 10 buses powered by White 1A engines, converted to full Diesel. These White engines have a special turbulence chamber in the cylinder heads of the engines. The chamber is similar in shape to the one used by Hercules, but the location is quite different.

Six 40-passenger Diesel-electric buses built by the Twin Coach Co.

40-passenger Diesel-electric bus operated by the Surface Transportation Co., New York

The Surface Transporation Corp. shortly expects delivery on two more Diesel-electric buses; these are to be powered by the new General Motors Diesels.

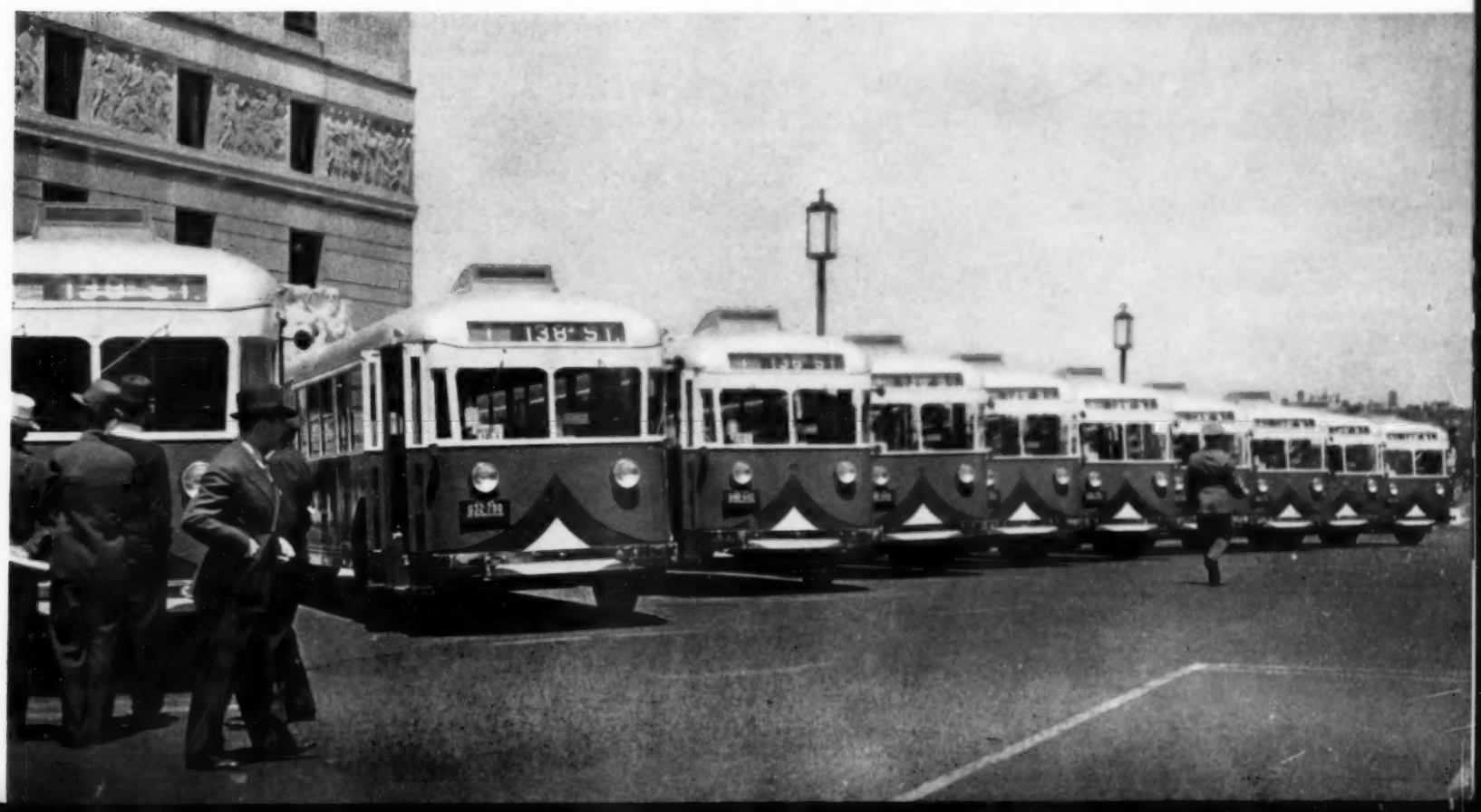
It is claimed that the Diesels burn 90 per cent of the fuel injected into the cylinder. This fact explains the almost complete absence of smoke and fumes from the Diesels. After the 25 mile trip from the White Plains Garage to the Bronx, one could put his hand on the bare exhaust manifold of this engine without being burned.

The new buses have leather-covered seats, and the window sashes are of chromium metal of the latest easily movable type. The interior lighting is especially designed to throw the light rays so that any reading matter in the hands of the seated passengers will be free of shadow. Safety glass is provided throughout the bus. The buses are equipped with a force ventilation system, which provides not less than 10 cu. ft. of air a minute. Each of the new buses cost approximately $11,000. The buses have an overall length of 32 ft. 11 in. and a width of 7 ft. 10 in. Their trim aluminum alloy bodies are neatly painted maroon and white.

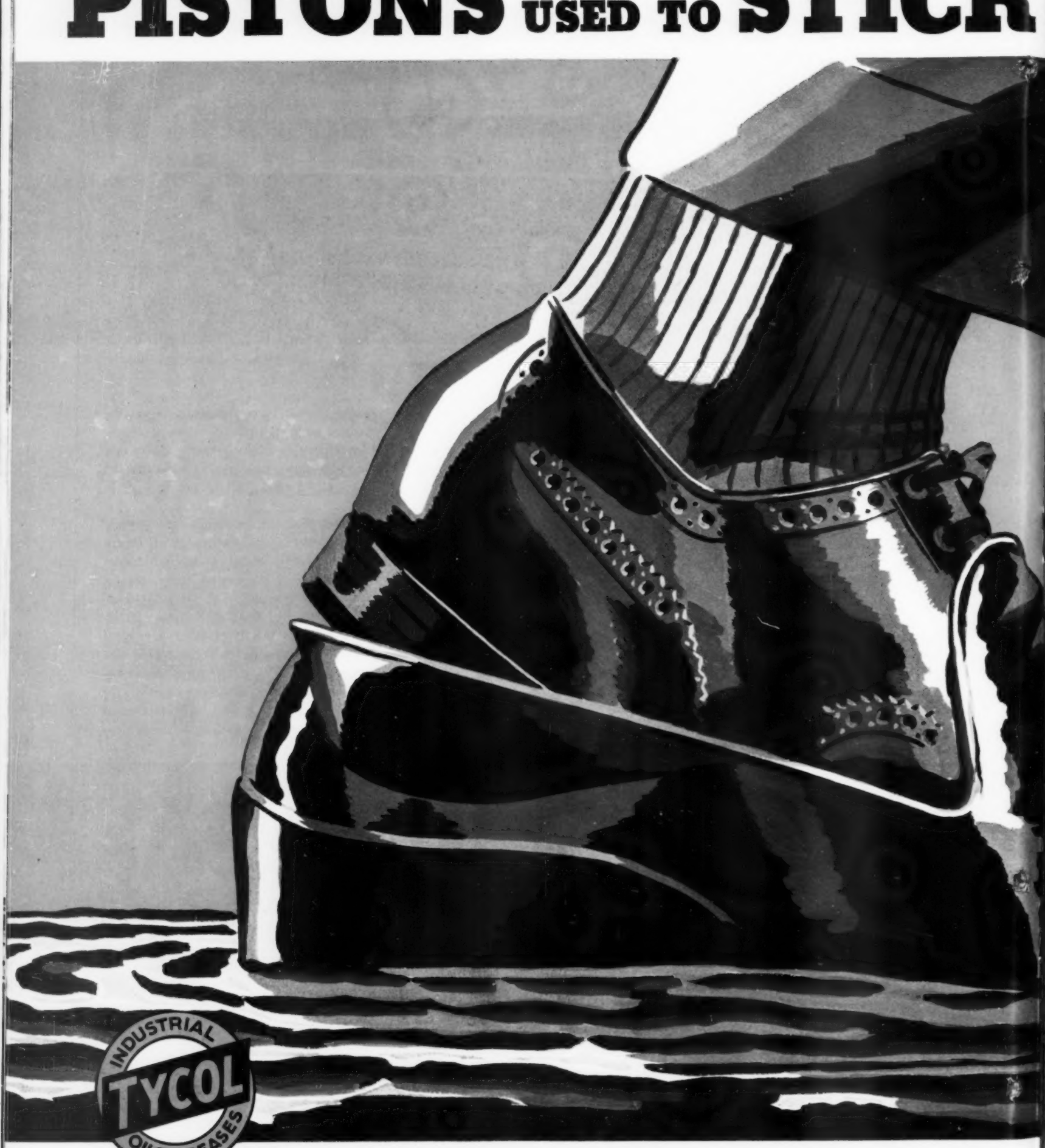
After riding in one of the new Diesel-electric buses, Borough President James J. Lyons called them a great improvement over the gasoline buses. After commenting upon the progress made with the development of the Diesel-electric bus, he expressed a desire that some day they would replace all outmoded trolley cars operating in the Bronx.

Slaughter W. Huff, President of the Surface Transporation Corp., declared that experiments have indicated that Diesel-electric buses will probably be the type generally used for city bus transporation in the future. It was also indicated by officials of the Surface Transportation Corp. that eventually two hundred new Diesel-electric buses would replace the gasoline powered buses now operating on sixteen routes in the Bronx.

Fleet of 10 Diesel-electric buses powered with 6-cylinder 125 hp. Hercules engines.



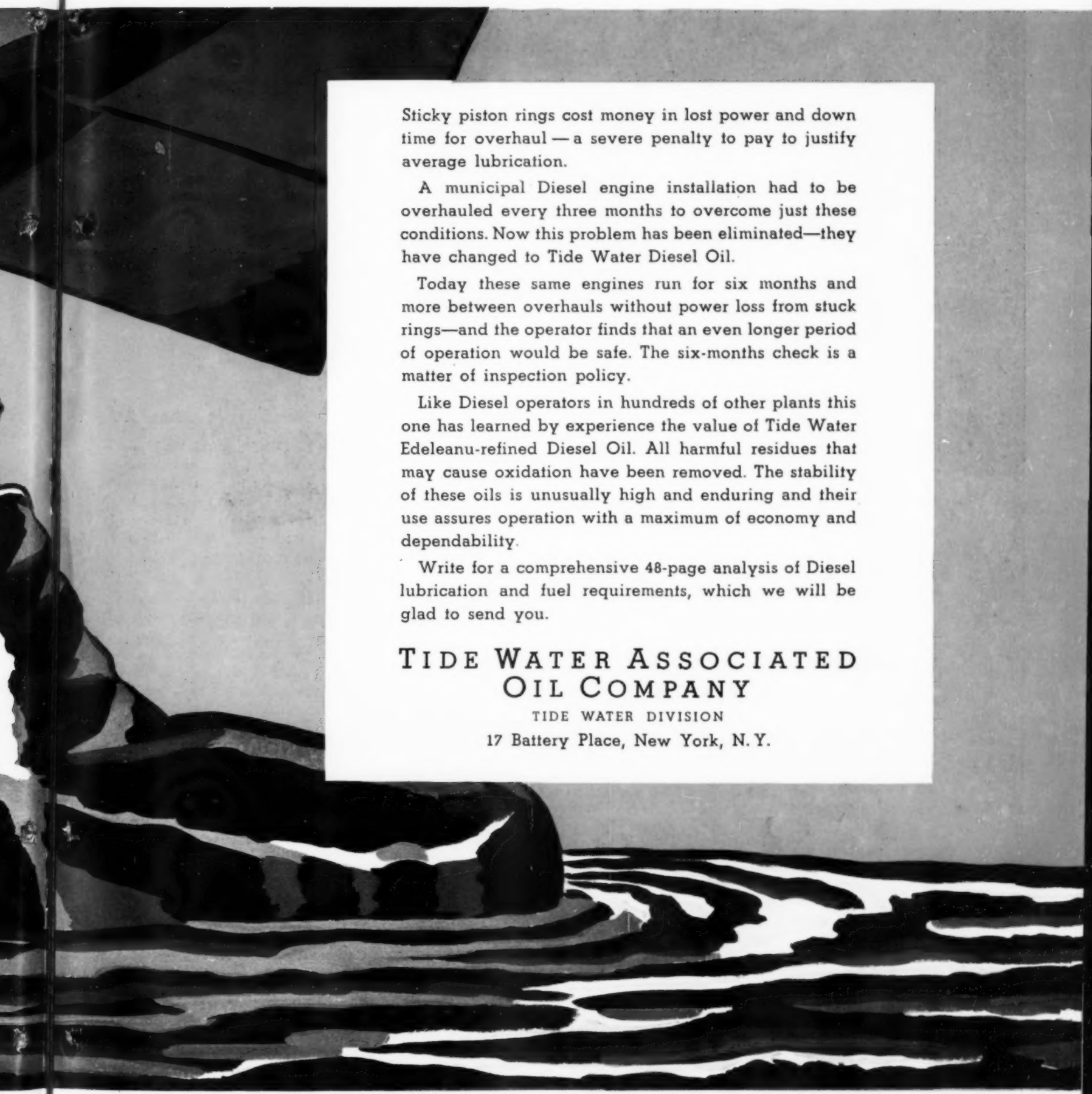
PISTONS USED TO STICK



TIDE WATER

THERE IS A COMPLETE LINE OF TYCOL LUBRICANTS

K LIKE RUBBERS IN MUD



Sticky piston rings cost money in lost power and down time for overhaul — a severe penalty to pay to justify average lubrication.

A municipal Diesel engine installation had to be overhauled every three months to overcome just these conditions. Now this problem has been eliminated—they have changed to Tide Water Diesel Oil.

Today these same engines run for six months and more between overhauls without power loss from stuck rings—and the operator finds that an even longer period of operation would be safe. The six-months check is a matter of inspection policy.

Like Diesel operators in hundreds of other plants this one has learned by experience the value of Tide Water Edeleanu-refined Diesel Oil. All harmful residues that may cause oxidation have been removed. The stability of these oils is unusually high and enduring and their use assures operation with a maximum of economy and dependability.

Write for a comprehensive 48-page analysis of Diesel lubrication and fuel requirements, which we will be glad to send you.

TIDE WATER ASSOCIATED
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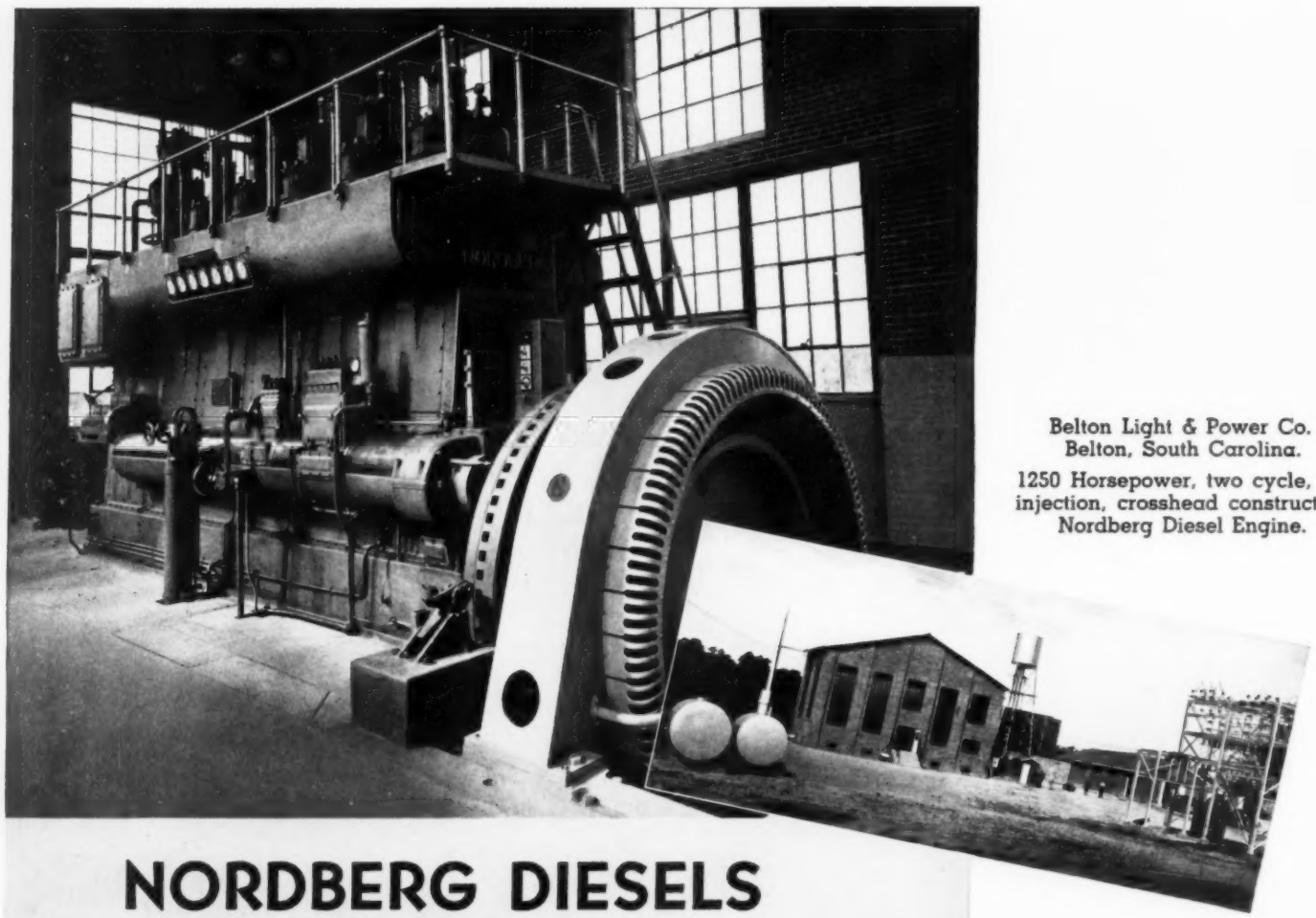
TIDE WATER DIVISION
17 Battery Place, New York, N. Y.

R DIESEL OIL

NTS SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE



Belton Light & Power Co.
Belton, South Carolina.

1250 Horsepower, two cycle, air injection, crosshead constructed, Nordberg Diesel Engine.

NORDBERG DIESELS
in combination with water power operation

Prior to the installation of this Nordberg Diesel Engine, electric service for the cities of Belton and Williamston and near-by rural areas in South Carolina was furnished by a hydro-plant located on the Saluda River about nine miles from Belton. Faced with a growing town load, periods of water shortage and having practically reached the limit of water power development, additional capacity and some form of stand-by unit became necessary. To meet this problem, the Belton Light & Power Company installed this air injection Nordberg Diesel unit which operates in parallel with the distantly located hydro-plant.

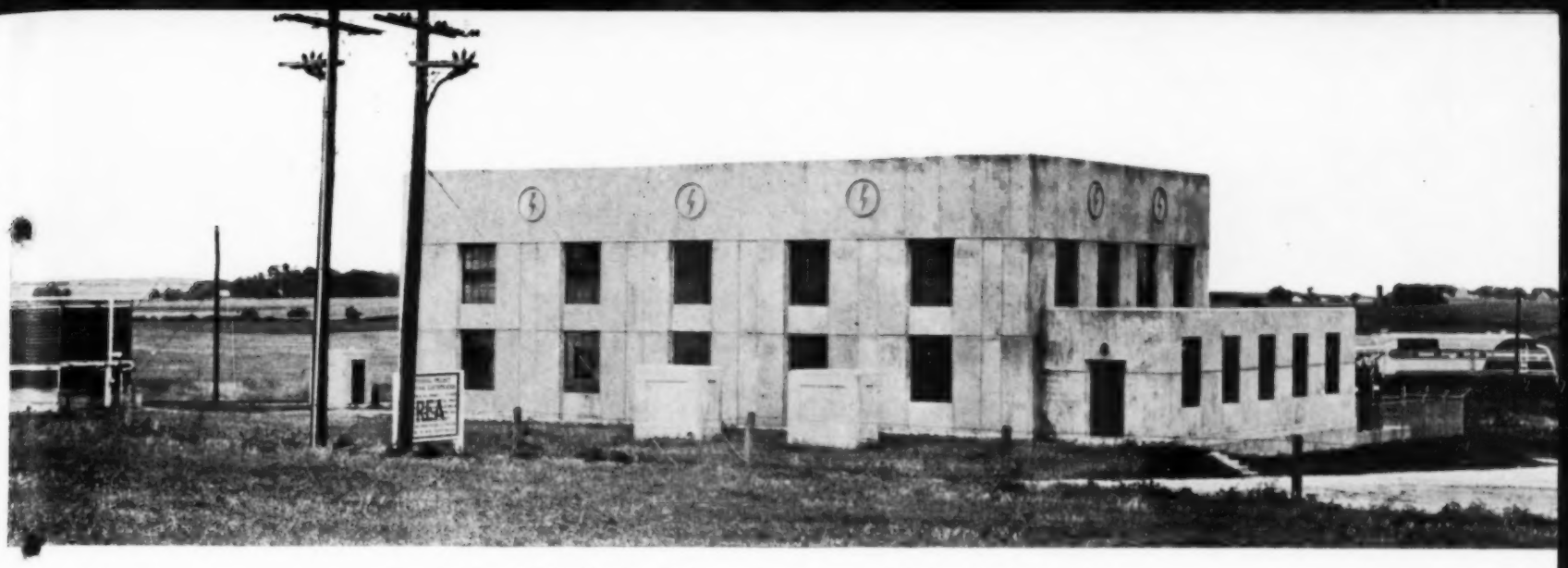
For stand-by service, the Nordberg Diesel installation has several advantages. In case of interruptions from the hydro-plant, the Diesel can be quickly placed in service and in a few minutes take on full load. High efficiency is obtained even for short periods of operation and when shut down, there is no stand-by fuel expense as is the case with a steam plant. Being an air injection engine, the cheaper, lower grade fuels can be burned economically. Nordberg Diesels, in combination with other water power plants, range from 550 to 12,000 in total horsepower installed.

OTHER NORDBERG INSTALLATIONS IN STAND-BY SERVICE

United States Government
Panama Canal Zone
City of River Falls, Wis.
City of Logan, Utah
City of Idaho Falls, Idaho
City of Marquette, Mich.
City of St. Louis, Mich.
City of Charlevoix, Mich
City of Marshall, Mich.

NORDBERG MFG CO., MILWAUKEE

NEW YORK	WASHINGTON	CLEVELAND	KANSAS CITY	DALLAS	LOS ANGELES
60 E 42nd St.	Barr Bldg.	318 Rockefeller Bldg.	3560 Broadway	3801 Potomac Ave.	Subway Terminal Bldg.



Exterior Rural Electrification Project at Reeve, Iowa. Schubert Christy Cooling Tower at left. A Rock Island Rocket Streamline train passing plant at right.

REEVE, IOWA

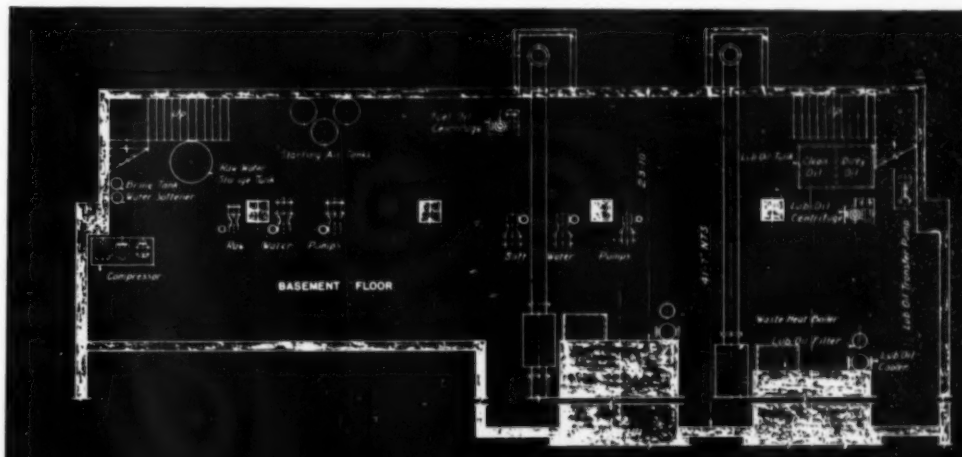
By ARTHUR OLIPHANT*

THE Federated Co-operative Power Association of Hampton, Iowa, has constructed a Diesel-electric generating station at Reeve, Iowa, under the provisions and with the financial assistance of the Rural Electrification Administration.

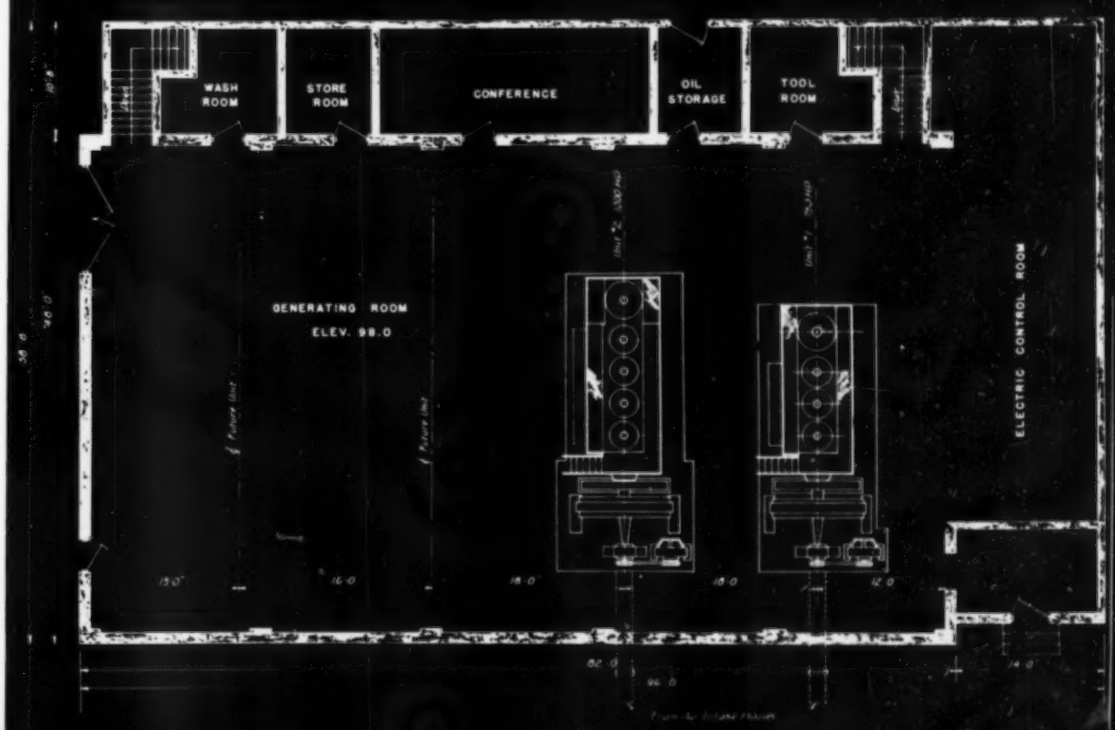
Electricity will be supplied within a radius of 60 miles of the plant at Reeve, and the Federated Co-operative Power Association delivers the current to county co-operatives wholesale and at cost, including of course a proportional share in the line losses. The County Co-operatives in turn will distribute and bill the electricity to its various members at cost plus overhead charges.

As is well known, the Rural Electrification Administration was formed to make it possible for rural communities to secure electricity. The original plan was that the electricity should be bought at wholesale from existing utilities or municipal plants. In certain sections of the country, however, it was not found possible to purchase electricity. Hence it was necessary for the R.E.A. to design and construct electric generating power plants in those territories. Such a plant as this is located at Reeve, Iowa, and is described in detail herewith.

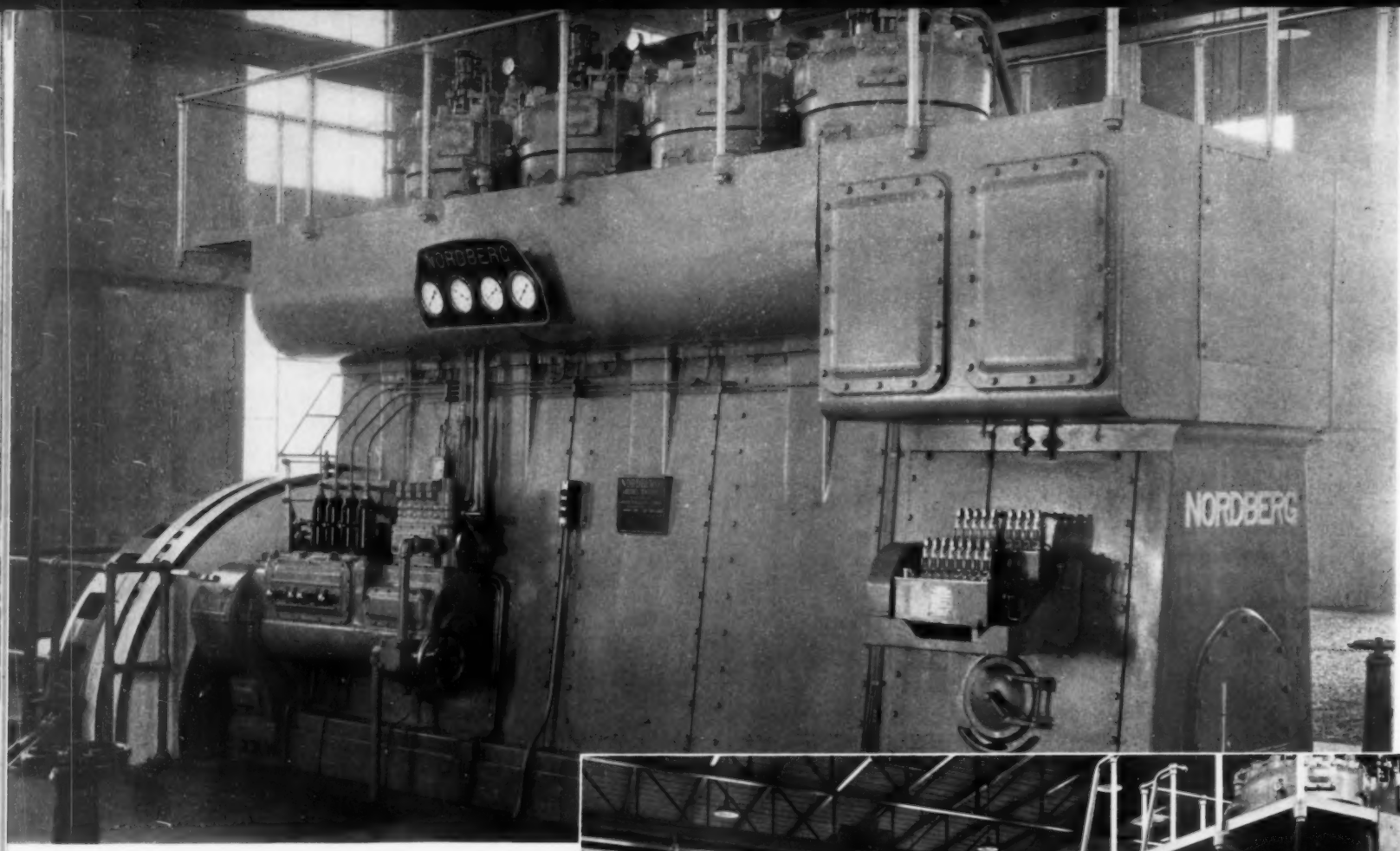
The farmers in this locality had for so long lived in hopes, that when the lines were finally energized there were many who just could not believe that electricity was at last available to them thanks to the Diesel engine. There were many humorous incidents, the following will serve apropos. Said one woman: "Why does my neighbor get red wires while my wires are black? Is she getting different colored electricity?"



BASEMENT PLAN



*Plant Superintendent.



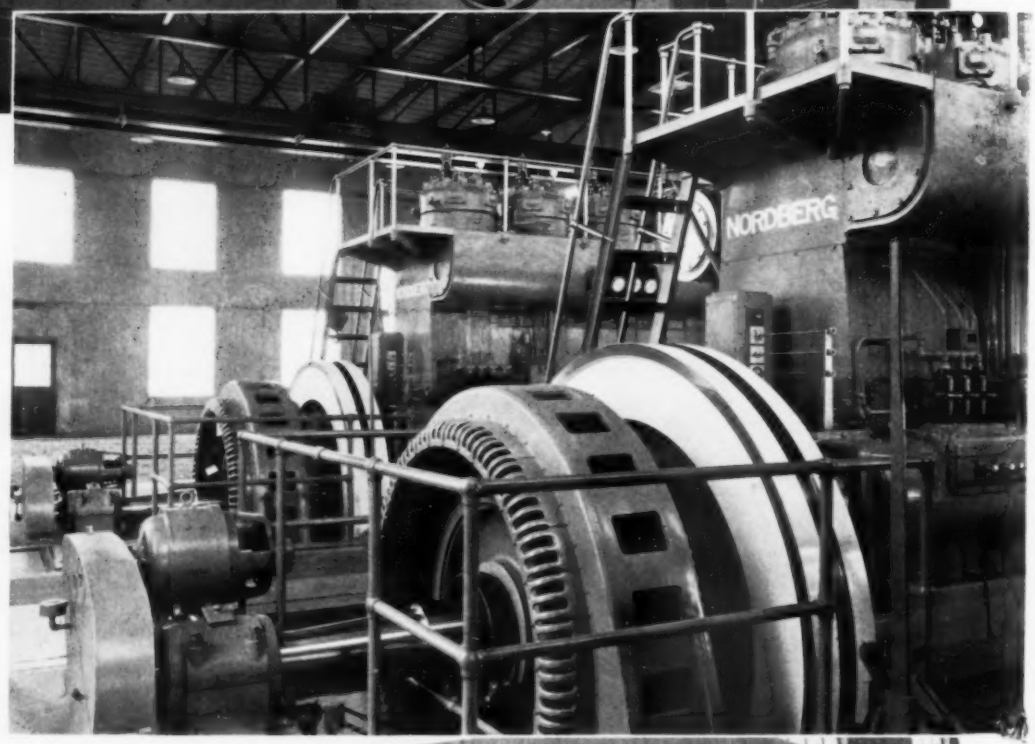
Operating side of four cylinder 1,000 hp. Nordberg above. To the right general view of plant showing two Elliott generators.

The plant at Reeve was designed by Young & Stanley, Inc., consulting engineers of Muscatine, Iowa. The building itself is of concrete and of monolithic motif; it is an expensive type of construction but it will prove itself worthy of the cost in the years to come.

The power plant consists of two Nordberg Diesels, namely, a 4-cylinder, 1,000 hp., 2-cycle crosshead type of 17-in. bore and 25-in. stroke delivering its rated power at an engine speed of 257 rpm., and a 3-cylinder Diesel of identical construction with an output of 750 hp.

The intake air for cylinder charging and scavenging is taken from out-of-doors rather than from the engine room proper. American air filters assure a supply of dust-free air.

The exhaust gases pass through waste-heat boilers, thence into vertical stacks. These boilers are of the water-tube, extended-surface type, which is somewhat of a departure in public power plant design. The low-pressure steam, obtained from the engine's exhaust heat, provides not only suitable means of heating the power plant adequately but it also assures a free-flowing supply of fuel oil. In addition, the waste-heat boilers are efficient mufflers for the engine's exhaust noise.



Delta Star Switchboard and switch gear.

GENERATING PLANT OF THE
FEDERATED COOPERATIVE POWER ASSOCIATION
DEDICATED TO THE DESIRE AND THE ABILITY OF FARMERS TO SERVE THEMSELVES WITH ELECTRICAL ENERGY THROUGH COOPERATIVE ENDEAVOR.
THE ELECTRICAL ENERGY GENERATED BY THIS PLANT IS CARRIED TO THE MEMBER CONSUMERS BY THE DISTRIBUTION SYSTEMS OWNED AND OPERATED BY THE VARIOUS COUNTY COOPERATIVES.
THIS PLANT HAS BEEN FINANCED BY A LOAN FROM THE RURAL ELECTRIFICATION ADMINISTRATION.
·BOARD·MEMBERS·
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ENGINEERS
YOUNG & STANLEY, INC.
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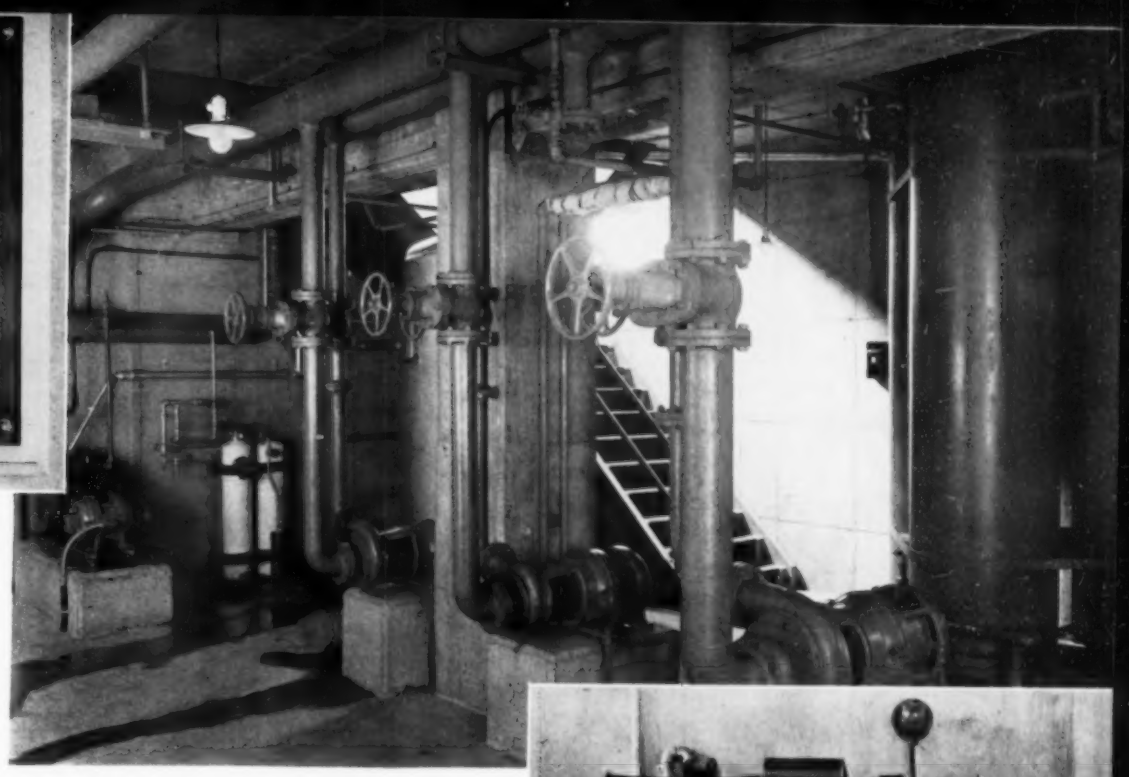


Illustration to right shows Quincy Compressor in left corner and three Goulds pumps. Crane valves and fittings used throughout the plant.

The engines are started by compressed air furnished by an electrically driven Quincy compressor. The engine equipment is unusually complete and indicates the care that has been given to assure that the plant is up-to-date in every respect. The engines are fitted with Woodward governors and Nordberg automatic stopping devices. Overspeed controls prevent the engines from reaching speeds that would cause frequency variations. Alnor pyrometers indicate the exhaust gas temperature and an Edwards alarm system is also fitted.

The Elliott AC generators are directly driven from the engine's crankshafts and their output is 700 kw. and 525 kw. respectively. They generate 3-phase, 60-cycle current at a potential of 2,500 volts which is distributed by means of three 500 kva., 2,500/12,500 7,200 volt transformers.

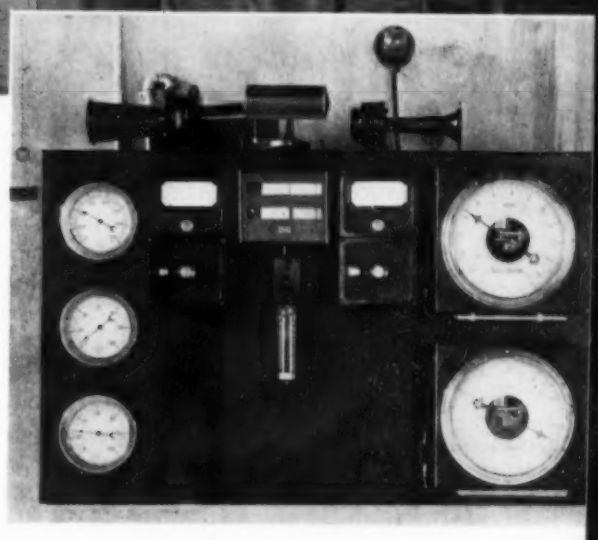
For the present, the peak load is 625 kw. for the system made up of five county co-operatives. The distribution lines total 2,800 miles and could serve 8,300 possible customers. The plant has been in service but three months, beginning with a load of only 50 kw., but in this short time the peak load has already reached 50 per cent of the plant's present capacity, which is remarkable indeed.

Of course, the plant was laid out to accommodate future demands, hence additional Diesel engines, together with the required electrical equipment, could readily be added whenever the demand necessitates increased plant capacity.

As in all northern regions where the winter's temperature reaches low levels, the fuel oil storage tanks at the Reeve plant can be heated with steam to assure a free flowing fuel supply. The care bestowed upon the mechanical and electrical equipment at Reeve is also reflected in the manner the fuel oil is conditioned so as to assure faultless operation of the Diesel engines. Nugent oil filters and Goulds Hydroil centrifuges free the fuel from impurities.

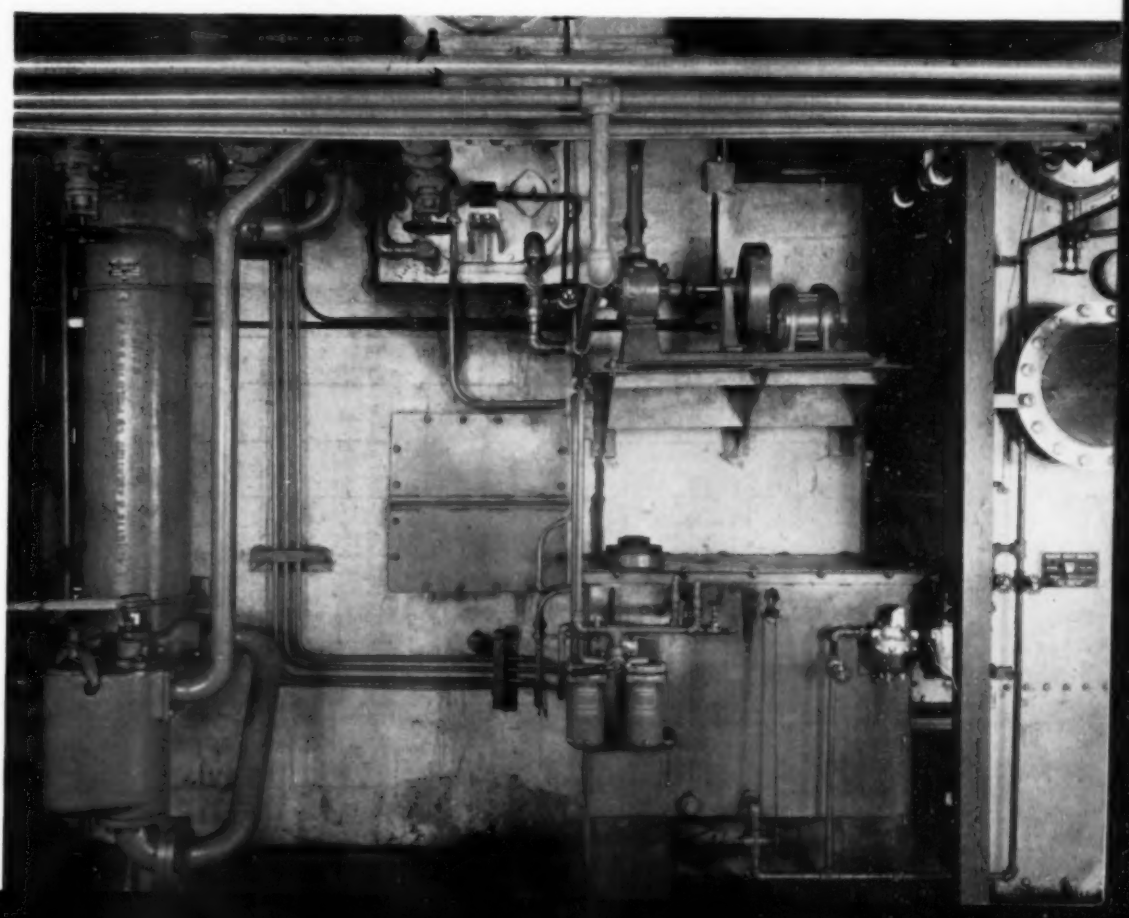
The engine's cooling water passes through a heat exchanger, the latter being connected with a Schubert-Christy cooling tower.

The switchboard is of Delta-Star make complete with instruments, meters and all accessories including synchronizing indicators and synchronizing lamps. All in all, the Reeve, Iowa, generating plant is modern in every respect and a credit to the citizens, whose spirit of co-operation has made the plant possible.



Above — Two Alnor Pyrometers supplying readings on both exhaust and water. Two Levelometers (Liquidometer Company's fuel gauges) and Edwards alarm system.

Below — Schutte Koerting heat exchanger at left. Duplex Nugent Filters in center. Viking transfer pump above and Foster-Wheeler waste heat generator at right.



"ALMA F" 50′ DIESEL YACHT

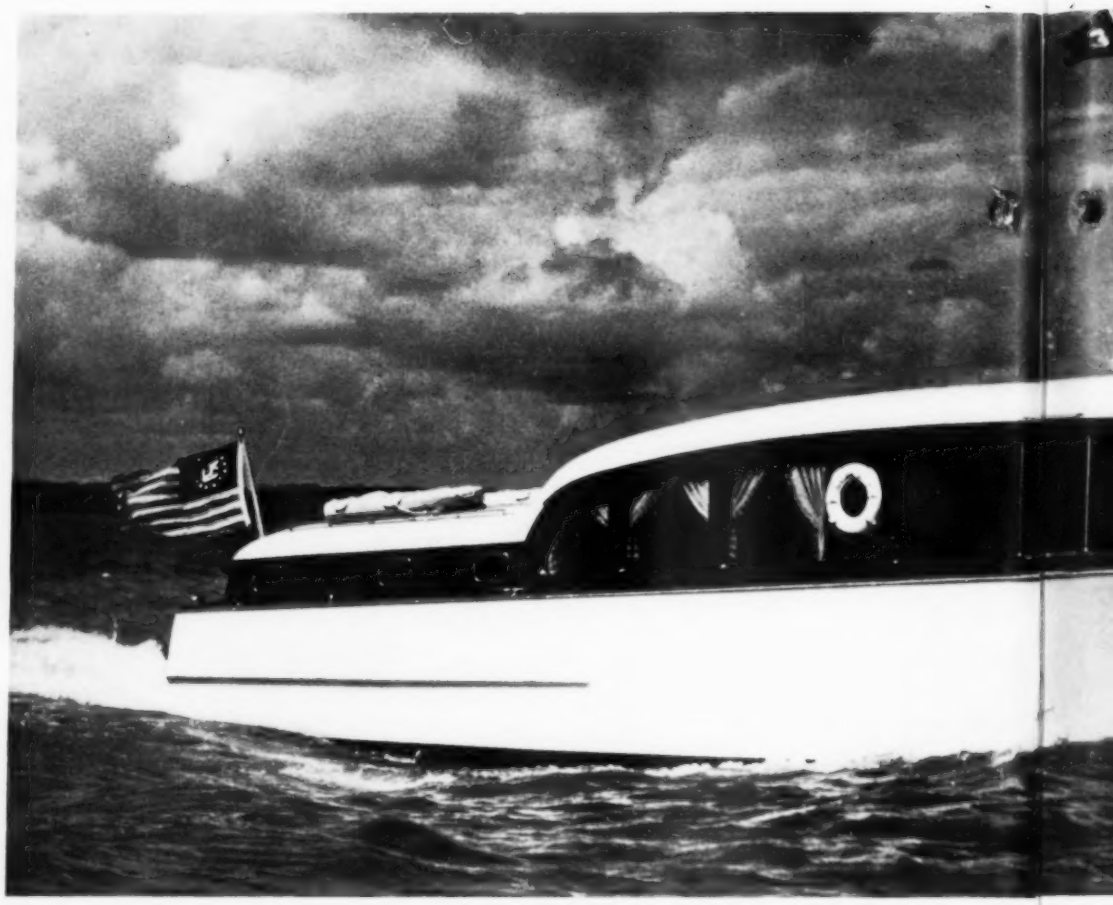
Powered with a pair of Gray Marine Diesels

YACHTING writers in attendance at the Gold Cup Races over the Labor Day week-end were given an opportunity of inspecting the *Alma F*, a new cruiser engineered and built by the Defoe Boat and Motor Works of Bay City, Mich., for Mr. A. J. Fisher of Detroit, and one of the first yachts to be powered with the new Gray Marine Diesels. The boat is 50 ft. over all, has a beam of 12 ft., and a draft of 3 ft., 6 in.

The power plant consists of a matched pair of 6-cylinder, 165 hp. Gray Marine Diesels with built-in reverse gears, driving direct on 21-in. by 15-in. propellers. A maximum speed of 20 mph. is obtainable with the engines turning up 1,850 rpm. Cruising speed is 17.5 mph. at 1,650 rpm. Gray Marine Diesels are based upon the engines developed and built by General Motors, adapted and equipped for marine use by Gray.

Electrical energy for starting, lighting, the radio, toilets and the fire and bilge pump is supplied by a bank of 32-volt Exide batteries. To keep these charged, a 900-watt self-regulating Delco-Remy generator is direct-connected to each Diesel. There is also an auxiliary power unit for use when the main engines are not operating. Since the owner did not want any gas or gasoline aboard, this is a 32-volt oil-burning Delco utilizing the same type of fuel as the Diesels. The galley range is alcohol-fired for the same reason.

Though technically a day cruiser, the *Alma F* offers sleeping accommodations for seven and a crew of two. There is a stateroom forward with two berths, a wardrobe, shower and toilet. Immediately behind this is a raised bridge deck combined with a large cockpit. Weather-proof curtains, as well as screens, are provided, making it possible to utilize this space as an additional stateroom.

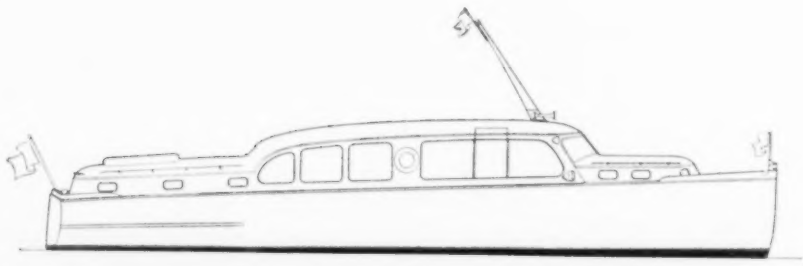


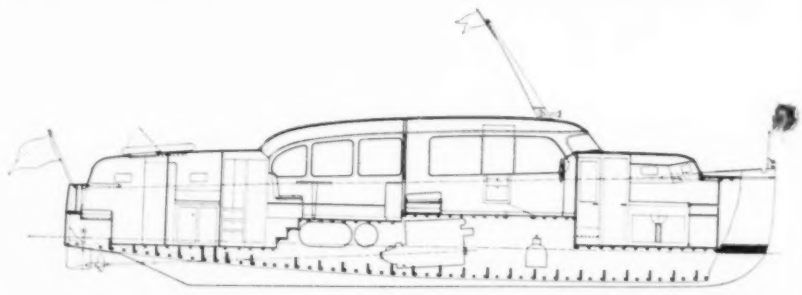
A full-length settee against the bulkhead that separates the cockpit from the glass enclosed dining salon may be employed as a third berth. Under this are stowed thick sponge rubber mattresses to be used in conjunction with the two folding cots that are carried aboard as part of the regular equipment.

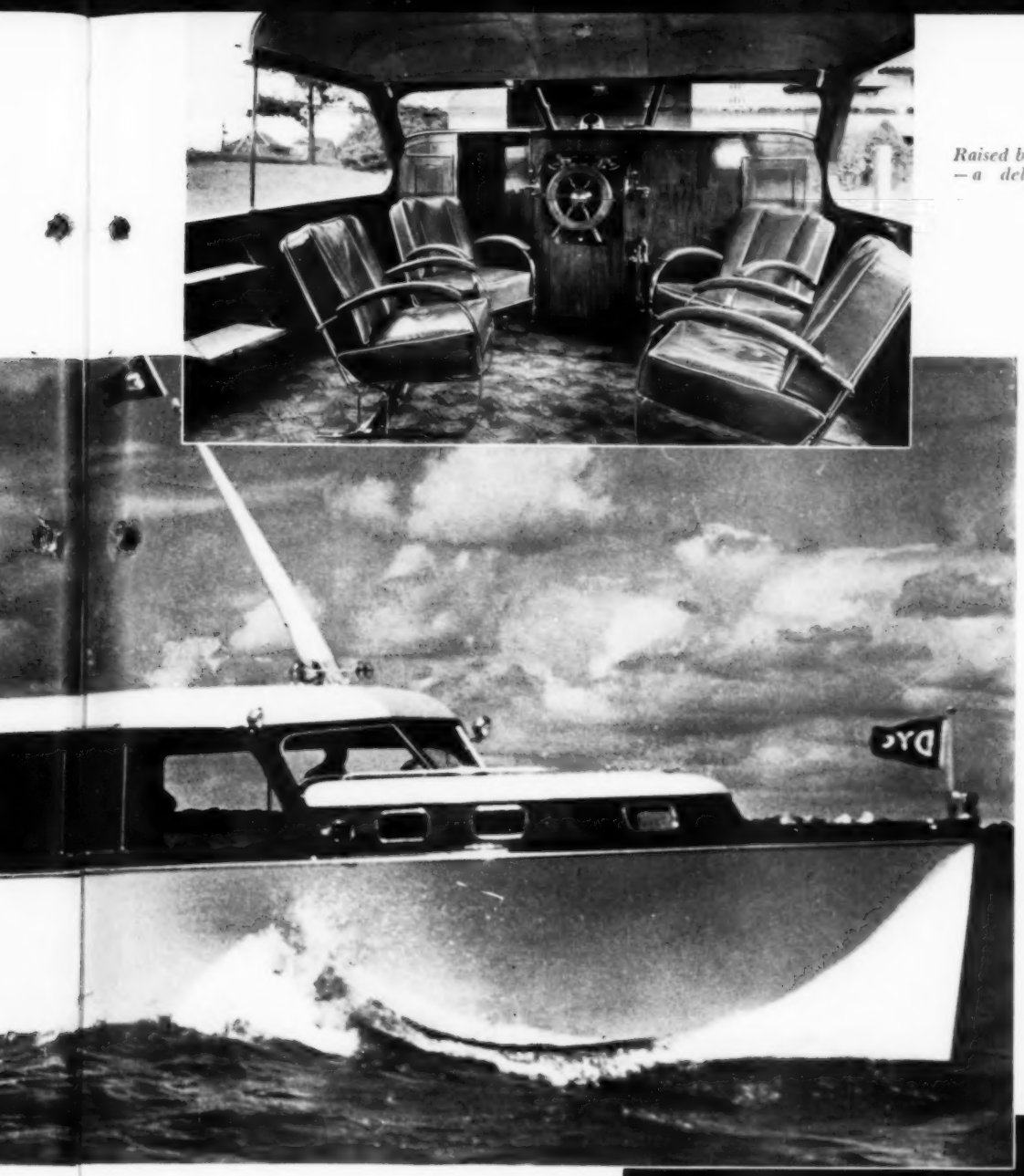
The built-in steps provided as an aid in getting in and out of the boat should be mentioned in connection with the cockpit. There are two, one on either side, which, when not in use, fold into recesses, leaving a flush interior surface.

The tables on either side of the dining salon are removable, permitting the use of the Pullman-type seats as additional berths. Another feature found in this compartment is a built-in radio, hooked up with loudspeakers in both the salon and cockpit, that may be controlled from either point. There is a second fully-enclosed toilet at one side of the companionway leading aft to the galley. Clothes lockers and cupboards are provided on the other. The engine room is under the cockpit, while a fresh water tank of approximately 200-gallon capacity and a 400-gallon fuel tank are located beneath the floor of the dining salon.

The galley is fully equipped with a Willis, 3-burner alcohol stove and water heater, a large







Raised bridge deck on the "Alma F" — a delightful place to lounge.

of a boat considerably greater than her actual dimensions.

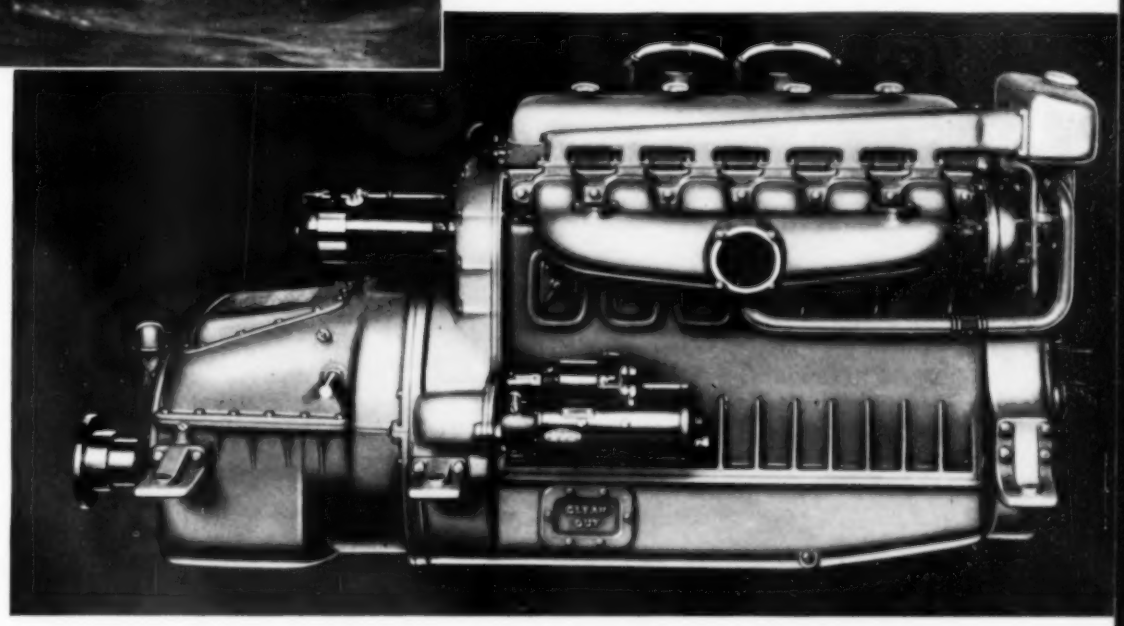
Design and construction of the deckhouse and trunks are unique in that they reveal the application of numerous practices developed in the automobile body-building field. The result is an extremely light upper works, offering exceptional visibility and acoustic qualities.

It might be explained that the over-all streamlined design is effective not so much in reducing wind resistance and increasing speed as in eliminating the whistling, flapping and roaring of the wind around the square corners, overhangs and lashings of the traditional type of superstructure. Besides this, it greatly reduces the time required for maintenance.

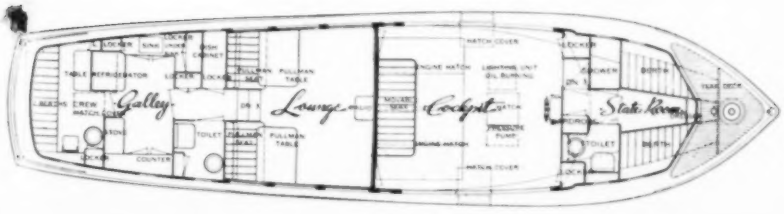
Only modern achievement in manufacture of materials and machinery permits the smooth molded surfaces; they were and still are practically impossible with the old standard mill and factory equipment, and are obtained only through addition to the shipbuilder's plant of certain machinery developed by the automotive industry. The Defoe company, which has installed this equipment has this year turned out two other streamlined yachts, one 114 ft. long and the other 143 ft. long, and believes there will be no return, so far as yacht design is concerned, to the former square corners.

refrigerator, a Monel metal work board to starboard and a sink to port. One of the features of the galley is that fuel for the stove and water heater is carried in a heavy 10-gallon copper storage tank, feeding from there to the 3-gallon supply tank. The intake pipe of the storage tank is brought up through the covering board outside, thus eliminating the annoyance of alcohol fumes in the cabin. The crew's quarters, which include complete toilet facilities, are just abaft the galley.

It will be seen that the interior arrangement, largely worked out by the owner, utilizes every inch of space aboard, and gives the appearance



Six-cylinder Gray Marine Diesel. This illustration shows Twin Disc combination reverse and reduction gear. Engines on "Alma F" are equipped with Joes direct drive gears.



These three drawings show excellent arrangement of the "Alma F" and how splendidly these new Gray Marine Diesels fit into the compact engine room.

THE CLERGET 14F-01 RADIAL DIESEL

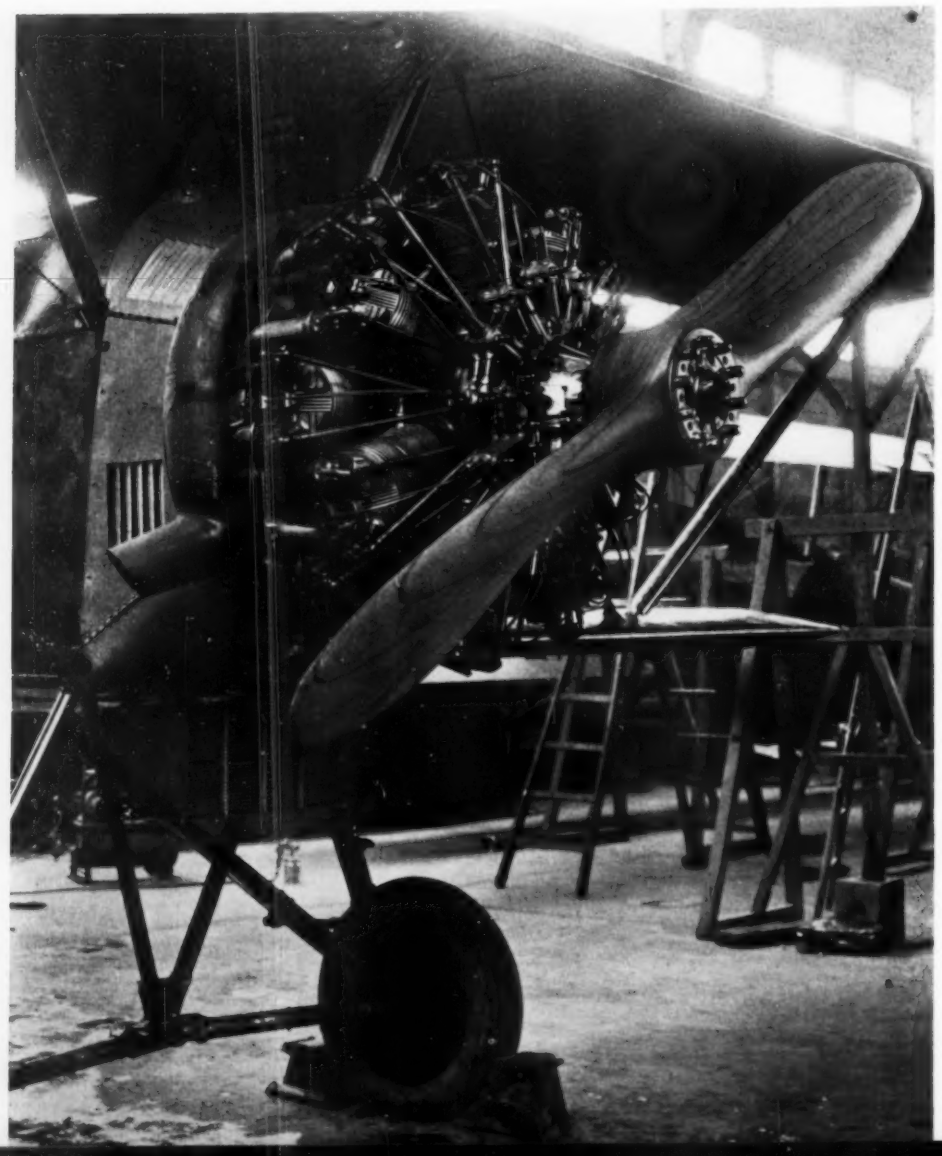
By PAUL H. WILKINSON

THE fine flight to an altitude of over 25,000 ft. by a Clerget Diesel in a Potez 25 observation plane recently, has focussed the eyes of far-seeing people in the aircraft world on this promising French engine. This performance demonstrated, in no uncertain manner, that air-cooling for a high powered Diesel is quite practical. It also clearly shows that already the air-cooled Diesel is a serious competitor of the air-cooled gasoline engines of France, Great Britain and the United States, and of the liquid-cooled Diesels of Germany.

M. Pierre Clerget, who designed the engine and its fuel system, has been a consultant on aircraft engine problems to the French government since 1921. At the time he became interested in the Diesel, little information on the subject was available, so he wisely took the air-cooled, four-cycle gasoline airplane engine of those days for his model, and converted it to operate on the Diesel cycle. Despite many difficulties, his first engine was completed by 1929, and this was known as the Clerget *9-A* Diesel. After passing its tests with a rating of 100 hp., it was installed in a Morane *120* airplane and made a successful flight on October 29 of that year.

This engine soon was followed by the 200 hp. Clerget *9-B* of somewhat larger displacement, and by the Clerget *9-C* with a rating of 300 hp. and a specific weight of 2.45 lb. per hp. In 1931, the latter engine made some flights in a Morane *230*, showing that the principles of the Clerget Diesel were fairly well understood. These three models all operated on the four-cycle principle, and were of the nine-cylinder, air-cooled radial type.

The Clerget 14 F-01 aircraft Diesel of 14 cylinders which attained an altitude of over 25,000 ft. in a Potez 25 observation plane.



Realizing that he needed a much greater power output from his engine, M. Clerget then turned his attention to the fourteen-cylinder, two-row radial type which was then becoming popular in the gasoline engine field. He redesigned his engine along these lines, and the first of his fourteen-cylinder Clerget *14-F* Diesels was produced in 1932. Although this model developed only 400 hp., nevertheless, the design was sound and by 1935 had an output of 450 hp. In that year, it made some fine cross-country flights in a Potez *25* observation plane, including a most satisfactory trip from Paris to Bordeaux and back. It is understood that on another occasion in 1935, an altitude of 19,360 ft. was reached.

After modifications had been made and the fuel system changed to double injection, the power output of the Clerget was increased to 500 hp. and by 1937, an output of 600 hp., with 750 hp. for take-off in its unsupercharged state, had been attained. Later in the year, a single-stage, gear-driven centrifugal supercharger of Gnome et Rhone manufacture was added, and a maximum output of 940 hp., with an altitude rating of 8,860 ft., was the result. This model, which is known as the Clerget *14 F-01*, weighs 1,477 lb., or 1.57 lb. per hp. Its specific weight, even though it is not a finished, production engine, compares very favorably with that of the latest air-cooled gasoline engines, such as the Napier "Dagger" *III* with its 1.62 lb. per hp.: and of the Pratt and Whitney "Twin Wasp" *SC-G*, with 1.32 lb. per hp. specific weight.

For flight testing the Clerget *14 F-01* has been installed in both a single-engined Potez *25* observation plane and in a twin-engined Bloch *220* bombing plane, with excellent results. Its most notable achievement so far was its fine altitude performance in a Potez *25* on December 18, 1937, when it reached a height of 25,114 ft. On this occasion, the plane was piloted by M. Détré, and the flight was made under the official supervision of the Aero Club of France. As the Clerget has been produced with the cooperation of the French government, it presages an excellent future for this Diesel power plant.

Much interesting data was obtained during this

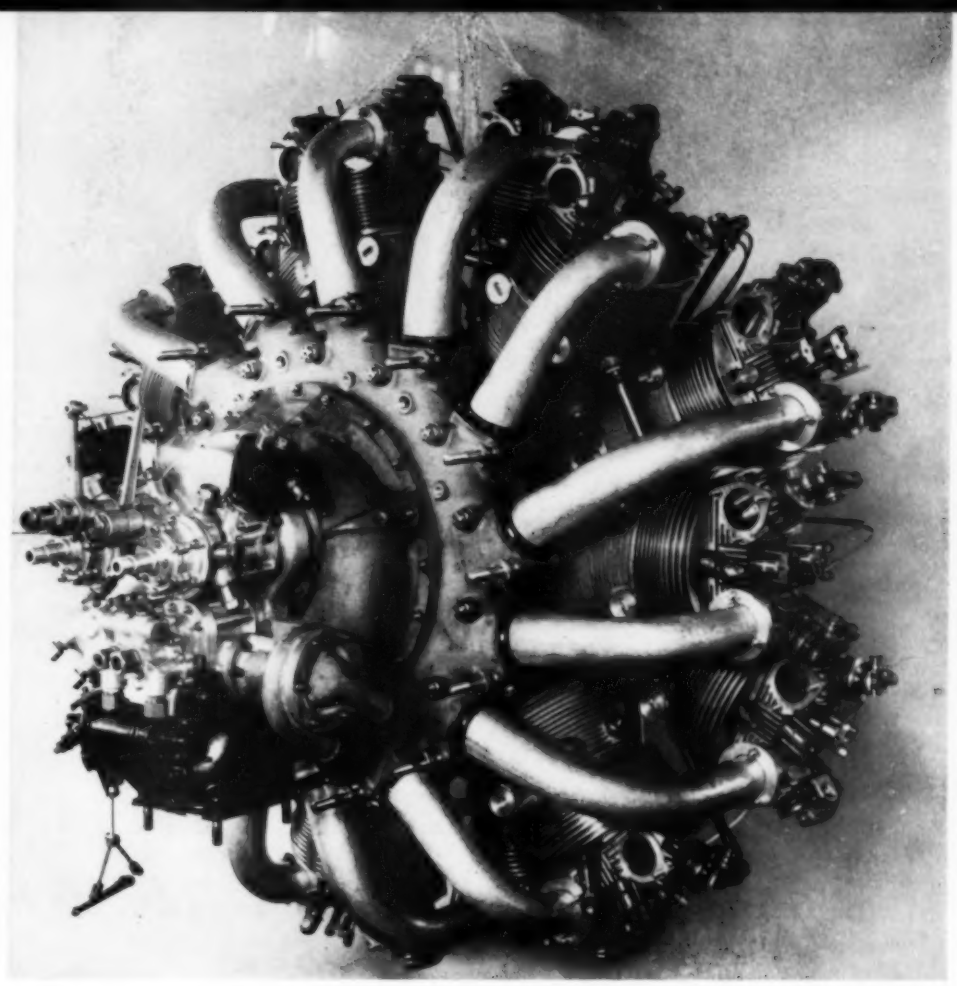
altitude flight. For one thing, it confirmed the claim made for the Diesel, that its rpm. and power output do not fall off as rapidly at high altitudes, as in the case of the gasoline engine. From the records kept, this was seen to be true above a height of about 13,000 ft. Then again, it found that ordinary commercial Diesel fuel such as was used for high-speed industrial engines, with a Specific Gravity of 0.832 and a Flash Point of 204°F., was quite suitable for the flight. Nor was the fuel consumption excessive, this being only 0.40 lb. per hp. per hour, despite the fact that the engine was running at speeds from 1,800 rpm. to 1,900 rpm. during the long climb.

Comparison of engine speeds at altitude of Clerget 14 F-01 Diesel and a gasoline engine of similar power, both engines using the same supercharger and propeller—

Altitude ft.	*Clerget Diesel rpm.*	*Gasoline engine rpm.*
7,870	1,745	1,745
9,840	1,775	1,730
13,120	1,820	1,720
16,400	1,880	1,705
19,680	1,900	1,690
22,960	1,900	1,660
24,600	1,880	1,650

The Clerget *14 F-01* Diesel which established this fine record, has a bore and stroke of 5.50 in. and 6.30 in., respectively, and a displacement of 2,105 cu. in. Its diameter is 50 in., which makes its frontal area 13.63 sq. ft. For take-off, its power is held down to 700 hp. at 2,100 rpm. (it being an altitude engine): while at 8,860 ft., its maximum power output of 940 hp. at 2,400 rpm. is obtained. Its compression ratio is 14:1, while its B.M.E.P. at maximum engine speed is 147 lb. per sq. in.

The construction of the engine is somewhat unusual, in that there are no castings used. All the working parts, such as the cylinder barrels and crankcase, are of steel; while for the light, less highly stressed parts, such as the cylinder heads, duralumin forgings are employed. The pistons are of "Y" alloy, with three pressure rings and three scraper rings, and a floating piston pin. The three-piece crankshaft runs in roller bearings, and at a crankshaft speed of 1,910 rpm., a piston speed of 33 ft. per sec.



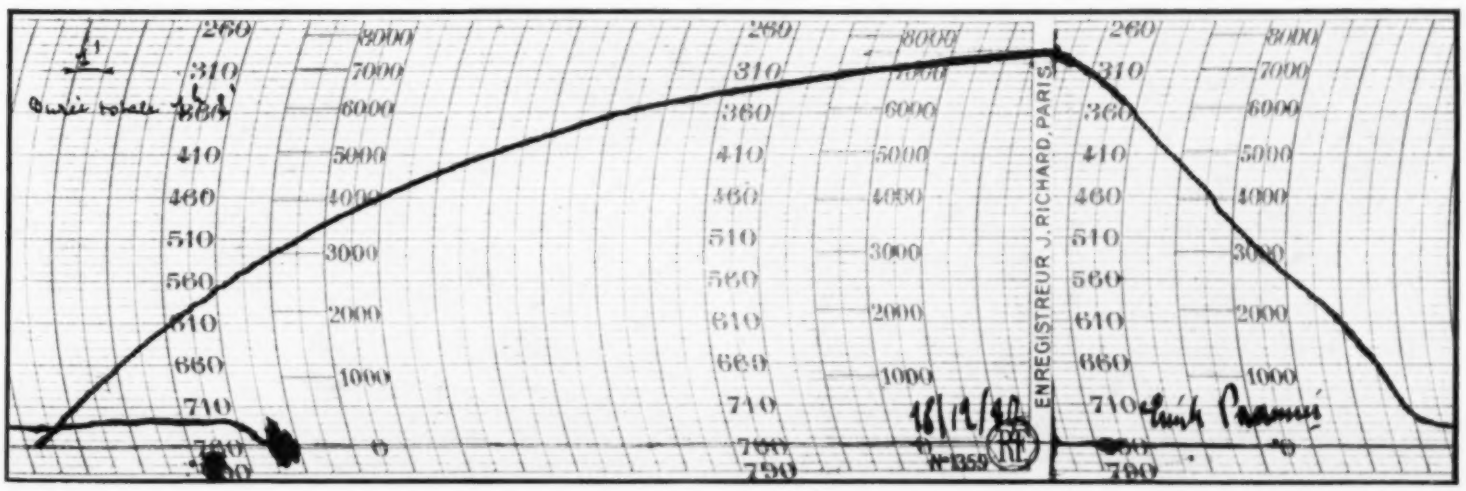
Rear view of the Clerget Diesel, showing the Gnome et Rhone gear-driven supercharger, the two Viet air compressors for starting and the starting valves (not connected) in the rear bank of the cylinders.

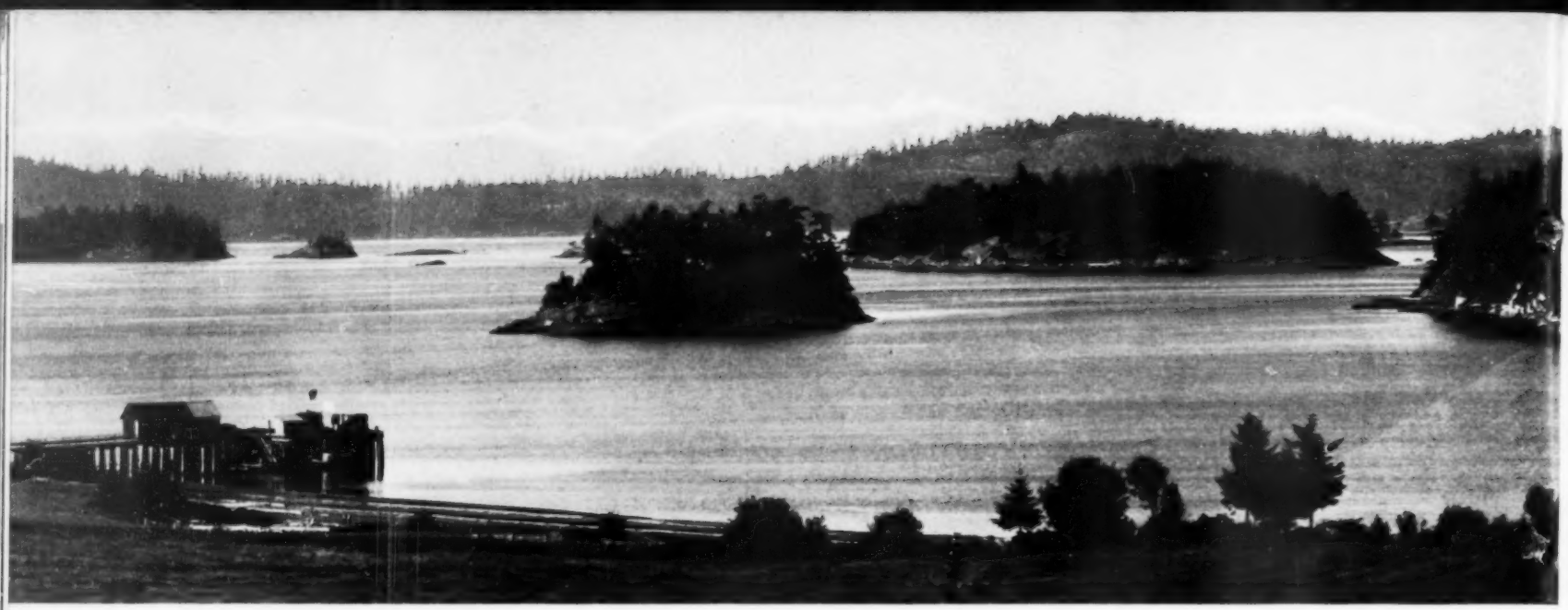
is attained. A notable feature, which in a way constitutes mixed cooling, is the use of film of water about 0.15 in. to 0.20 in. thick between the barrel of the cylinder and the surrounding crankcase flange to equalize the expansion that takes place.

The fuel pumps and injectors are of Clerget design and manufacture, and operate at a pressure of 8,820 lb. per sq. in. Each pump supplies two injectors, which are of the closed nozzle type. The pumps are located around the front part of the crankcase and are operated by short push rods from two cams, one for each bank of cylinders. The operating mechanism is unusual, in that as each cam revolves, it actuates in succession four tappets in a housing which itself is revolving in the opposite direction at one-eighth crankshaft speed. As the housing revolves, its tappets in turn actuate the push rods of the pump plungers, so that one plunger is operated every two revolutions of the crankshaft.

The cam itself can be moved axially on the crankshaft and by so doing, the timing of all the pumps can be advanced or retarded. The effective pump stroke can be altered and thereby its suction, which regulates the amount of fuel it delivers to the injector, and constitutes the throttle conrol. The lower portion of the barrel projects into a fuel reservoir just inside the crankcase, in which the fuel is kept in motion with a small gear pump.

Barograph record of the altitude flight of the Potez 25 powered with the Clerget Diesel, the maximum height attained being 7,655 meters or 25,114 ft.





Most westerly bay on Orcas Island, Olympic National Park in the background.

DIESEL-ELECTRICITY FOR FARAWAY ORCAS ISLANDERS

By CHARLES F. A. MANN

IN the far northwest corner of the United States in northern Puget Sound lies one of the world's most magnificent island archipelagos. Banked against the eastern shores of Vancouver Island, on the Canadian side, this vast island group is known as the Gulf Islands, current mecca for a sizeable migration of English people who seek relief from taxation and a place to live in luxurious peace for the rest of their days. On the American side the archipelago is known as the San Juan Islands, a tangled maze of over 750 named land masses exposed at low tide and 456 exposed at high tide. Popular grouping has fixed this as 172 defined island groups within the San Juans proper. Because of their location in the sound, and directly behind the Olympic National Park, whose sheltering wall sweeps the excessive rain from the westerly winds, the San Juans enjoy one of the most remarkable climates on Continental North America. Their rocky formation, steep walled beaches, rolling farmlands and magnificent expanses of seashore (1,100 miles of sea frontage coiled within the San Juan Islands), have made them an ideal retreat for vacationers and those who seek a peaceful existence minus the worries of railroads, paved highways and large city populations. For over 95 years San Juan Islanders have enjoyed a unique existence. The largest of these beautiful, wooded islands is Orcas, a vast three-lobed mass of land rising above three deep bays, which indent the island mass so deeply as to almost cut it in separate pieces. Approximately 350 families live on Orcas Island, most of whom are either retired or operate small resorts for the summer boarders from Vancouver, Victoria and Seattle. Electric power requirements of the summer tourist crop have given rise to the most amazing collection of little electric generating plants to be found anywhere. Old one-lung gas engines, outboard motors, Delco battery sets, steam donkey engines, discarded marine motors, etc. Originally the fish crop in the nearby lush waters of the Sound was the principal crop to be harvested. Next came the farm and fruit crops to feed hungry crews of sailing vessels that could easily swing in from the sea to secure provisions without being becalmed in a busy harbor. The third and most profitable crop has been the tourists, who came after the ferryboats began linking up the mainland with the Islands on frequent schedules.

It remained for the advent of Mr. Roosevelt's REA setup to come along and stimulate the idea of creating a complete public utility in miniature on Orcas and give everybody all the power he could use at much lower rates. At the end of the year those old individual plants showed costs up to 12 or 14 cents per kw. hr. If this could be cut in half with central station service, there were sufficient customers to make a reasonable investment pay. Under the Rural Electrification Administration surveys were made in 1936. Owing to the fact that 50 or 60 miles of transmission line would have to be strung to reach these 350 consumers, and probably over 100 of them would not tie into the system until electricity was actually being delivered, the first feeling was that the project would be hopelessly above any reasonable cost. However, after one of those good old-fashioned American pieces of rural cooperative action, nearly three-fourths of the hard-shelled, individualistic Orcas Islanders were drawn into a fine cooperative group known as the Orcas Power and Light Company, with headquarters at East Sound, a spot lying at the apex of the two big land masses, at the head of the largest bay of the East Sound. One of the points at which Washington, D. C., officials of the REA balked was the fact that the load on the system would be heaviest during the summer tourist season, yet the resort owners would not be able to pay on a basis of maximum demand, hence a lowered income was in sight for an investment big enough to care for top peak loads.

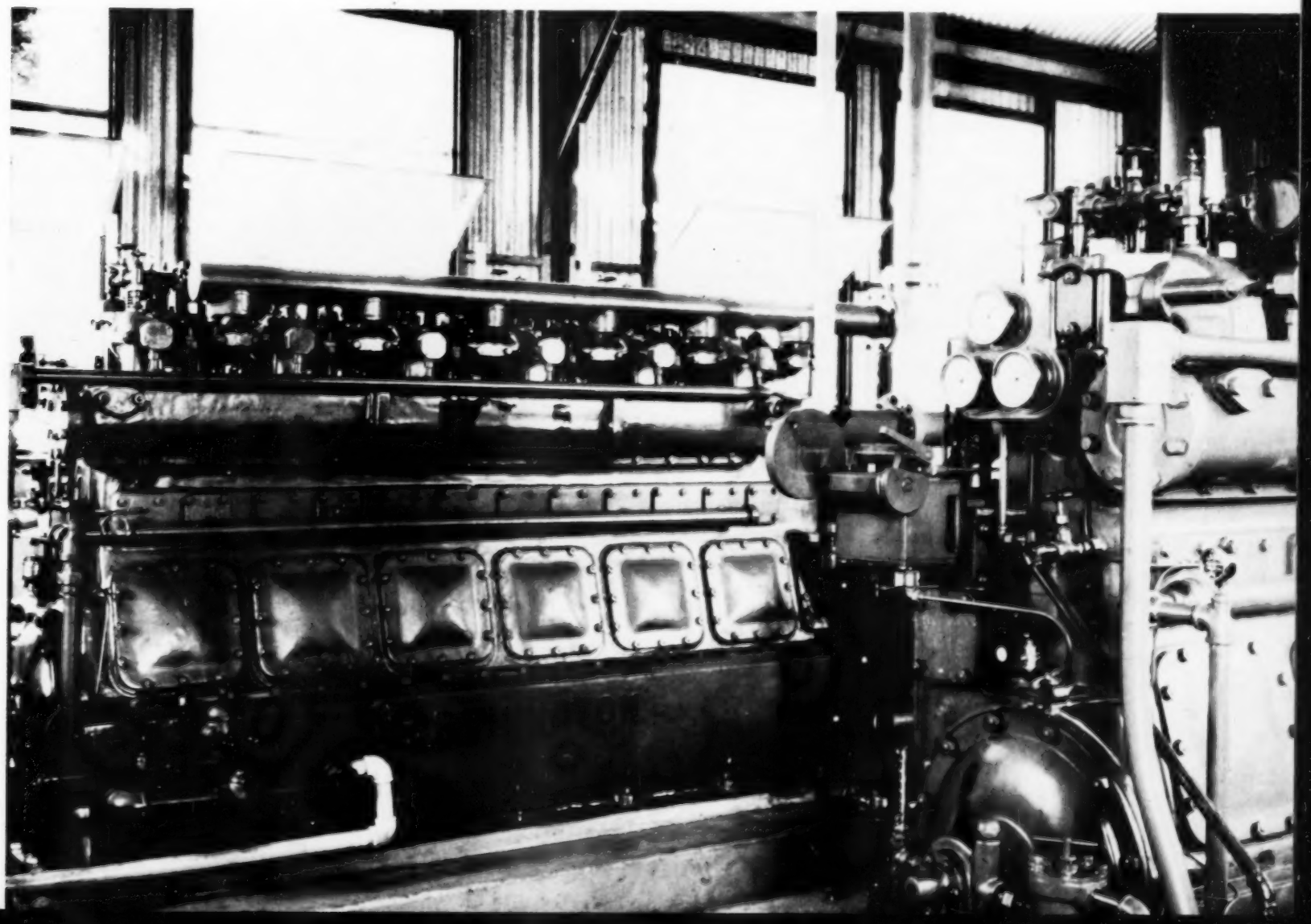
The enterprising Islanders concocted the idea of drafting pledges to use so much electric current each month and sent the signed individual pledges clear to Washington, D. C., as a flock of promissory notes to guarantee the REA cash investment! So impressed were REA officials that they turned on the "heat" and Orcas Island was the first isolated rural community in the U.S.A. of its type to get a long term loan. Orcas folks were so jubilant they staged a week-end wake as only these people know how!

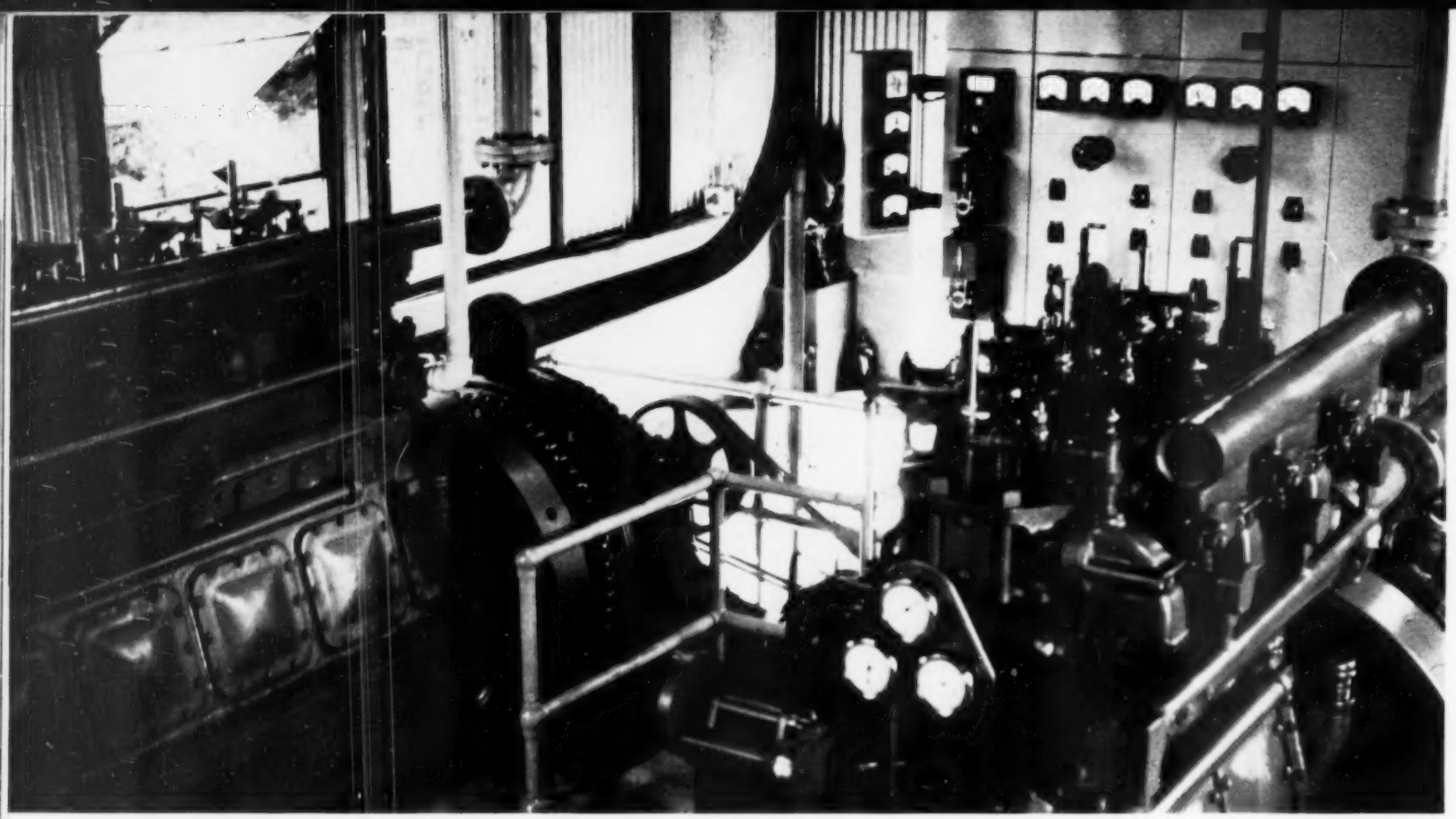
The Orcas setup is a mutual cooperative power company, which, by virtue of its membership fees and mutual voting arrangement, escapes all Federal and State regulation, fees and taxes of every kind. The government loaned the system $120,000 to be repaid at 2.77 per cent interest over a period of 20 years. By cutting off 50 members in isolated spots, the system started off with 233 customers who paid five dollars each, plus promissory pledges. The final contract prices on the system were $36,527 for the generating plant, installed by the Ne Page McKinney Co. and the Worthington Pump and Machinery Co.; $70,996.66 for 52 miles of single, 2 and 3-phase transmission lines; $1,959.35 for 275 Westinghouse current meters and $3,000 for the Allis-Chalmers transformers and substation. Mr. T. C. Smith of Seattle is Chief Engineer for the project and Mr. E. W. Johnson is Superintendent. The Diesel engine installation was handled by Mr. Charles Cummings of the Worthington Agency.

Generator station at East Sound, Wash., Orcas Island.

The greatest difficulty in construction of the system was the fact that in many places the soil is thin and rocky and the main roads on the Island follow the seashore instead of reaching very far inland. Many of the poles had to be set in holes blasted out of solid rock. Heavy underbrush and timber and scarcity of suitable cedar piling made it necessary to import treated

The two Worthington engines of the Orcas Diesel-electric plant.





Worthington Diesels directly coupled to A.C. generators, Orcas Island plant.

poles from down Sound ports. The distribution is a Star system with grounded neutral, 7,200-12,450 volts single phase. Forty-eight miles of single phase line, 2½ miles of two phase and 1½ miles of three phase line, or a total of 52 miles comprises the system. Hard drawn No. 6 bare copper wire was used in place of cheaper aluminum because of wind-driven salt water spray that occurs during the winter. Salt water corrodes aluminum cable, but only gives copper a green coating.

Due to the topography of the Island, which has a mountain backbone, much of the lines run over private property and near the shoreline. At one point in huge Moran State Park (4,000 acres), the lines were carried through in underground cables buried beside the road. Moran State Park and nearby Rosario (1,500 acre estate of Mr. Robert Moran, retired builder of the old battleship *Nebraska*) are two of the showplaces of Western America. Mt. Constitution in Moran park rises 2,400 feet above sea level. Over 700 islands are visible from its top, in two countries.

The main power house is a little steel framed, tin-covered building located under a grove of trees near the center of the load, at East Sound. The machinery itself is almost entirely automatic. There are two main generating sets, a 3-cylinder 75 hp., 4-cycle Worthington unit rated at 50 kw., and a 6-cylinder, 150 hp. Worthington set of exactly the same type. Each Diesel drives a General Electric alternator. The engines are 8-in. bore and 10½-in. stroke and deliver their maximum output at 514 rpm., with a piston speed of 900 feet per minute. The bmep. is 73 lbs., with maximum cylinder pressure of 600 lbs. Weight of the smaller unit is 9,600 lbs. and the larger 13,750 lbs. Bosch fuel injection equipment and Woodward governors are fitted. The generators are 60-cycle, 3-phase, 2,400 volts. The three 75 kva. Allis-Chalmers transformers are carried on two poles outside the main building, stepping up the current 300 per cent to line voltage. The switchboards were manufactured by the Ne Page McKinney Co., almost entirely equipped with General Electric instruments.

The fuel oil tanks are 13 ft. 6 in. long by 8 ft. in diameter and have a total capacity of 5,000 gallons. Fuel oil is delivered by ferry boat from Anacortes. Cooling of the main engines is by two Sturtevant radiators mounted on one wall, each cooled by a motor driven fan through rope drive. They are size 8,000 and 6,000 respectively. Automatic alarms are fitted on fuel and water lines. A 2-hp. Novo gas engine is used to run an auxiliary air compressor and a 1½-hp. G.E. motor is normally used. Two Worthington type 34-GS lubricating oil pumps, both motor driven.

Three main load combinations are possible, using either the small or large engine, or both in tandem for heavy loads. The Orcas Island plant is one of the most unique and complete, if not the most unusual in the United States. Because of the hard work necessary to form this mutual company, every director and officer worked untiringly without pay and will continue to do so. It is well to record that those who helped to bring central station electricity to an island without sufficient hydro power, too remote to tie up to mainland systems via submarine cable – too remote and costly for steam or gasoline engine power – deserve much credit.

The Managing Board of the Orcas Island plant consists of the following:

Henry Cayou, Chairman,
Amos Coffelt,
Max Harrison,
Edw. J. Young,
Charles Gerard,
Harry Walrath,

John E. Harrison, Secretary-Treasurer,
and the success of the enterprise is due to the efforts of these men.

The REA at Washington, D. C., cites the new Orcas Diesel generating system as a model for the entire U.S.A.

Caterpillar type D 17,000 Diesel engine of 180 hp. at 1,100 rpm. installed in a Trojan 40-J Truck.

MONSTER DIESEL TRUCK

By GEORGE D. CROSSLEY

THE world's biggest truck, a 43-yard monster, was pressed into service in Los Angeles, California. The truck worked for 120 hours on flood control work and during that time moved about 9,000 cubic yards of earth.

On a four-mile haul, the truck will handle an average of 85 cubic yards of material per hour. and will do this work on approximately 3½ gallons of Diesel fuel.

At Los Angeles, the truck transported two 42-yard loads an hour on a 2½-mile round trip. An especially designed tail gate makes it possible to load the truck to its maximum capacity, regardless of the type of material being handled. The truck may be unloaded within 45 seconds by means of a sliding bulkhead in the body that pushes the load out and spreads it simultaneously. The truck has been built by the Trojan Truck Manufacturing Company and is powered with a Caterpillar 8-cylinder V-type Diesel engine with a bore of 5¾ inches and a stroke of 8 inches. Turning at 1,100 rpm., the motor develops 180 hp. maximum, and its greatest torque, 1,025 ft. lbs., is reached at a motor speed of 650 rpm.

The truck is a 12-wheel drive with two sets of triple tired wheels in the rear. There are, in all, 14 demountable type disc wheels, 24 x 12 inches, with tires of the 20-ply excavator type.

In spite of its immensity, the Trojan-Caterpillar engined Diesel truck is unusually cheap to operate, having made regularly two 42-yard loads per hour on a 2½-mile round trip and consuming but 3½ gallons of Diesel fuel, costing 5½ cents per gallon.

Loading Trojan Diesel-engined truck with 42 yards of material.

The "CARDINAL"—Another Bushey-Built Tug

By GEORGE D. CROSSLEY

THE *Cardinal* is the 15th tug built by Ira S. Bushey & Sons, Inc., of Brooklyn, N. Y., equipped with Diesel engines. This firm having thus had a wealth of experience with Diesel-engined tugboats over a period of years, it is to be expected that the *Cardinal* represents their culmination of modern Diesel engine installation.

The hull of the *Cardinal* is of all-welded steel construction; its length is 82 ft., its width 21 ft. and the mean draft is 8 ft. The entire hull proper is used to house the Diesel engines, the auxiliary machinery and the fuel tanks. The captain's and crew's quarters, the galley and, of course, the pilot house are located within the superstructure in the customary manner.

The *Cardinal's* main propulsion engine is a Fairbanks-Morse 5-cylinder Model 37D Diesel 14 in. bore, 17 in. stroke, delivering 575 hp. at 300 rpm. It being a marine Diesel engine, it is fitted with built-in reversible type water and lubricating oil pumps. The engine is directly connected to an 82 in. by 40 in. three-blade Columbian propeller. A marine auxiliary Diesel set consists of a 20 hp. 2-cylinder model 36-4¼ Fairbanks-Morse engine clutch connected to a 12 kw. 40 volt marine type generator; a 75 gpm. rotary type water pump; a 23.9 CFM, 250 lbs. air compressor and a 2-in. Fairbanks-Morse rotary pump driven by a 1-hp. 32-volt electric motor.

The main propulsion engine is started by means of compressed air, whereas the auxiliary engine is set in motion by an electric starter. The engine equipment is unusually complete, to wit:

Engine noise is muffled by means of a Vortox air intake silencer and a Maxim exhaust silencer. Two Weston electric tachometers indicate the engine's speed. Brown exhaust pyrometers with five thermocouples (one for each of the five cylinders) indicate the exhaust gas temperature. Two Marshall Towne alarms, one for the engine's cooling water and one for the lubricating oil, give warning whenever the temperature of either exceeds the normal. Cuno filters condition the fuel oil and the lubricating oil passes through a Youngstown Miller oil purifier.

The latter, clearly shown in Fig. 3, purifies and reconditions the lubricating oil thus assuring trouble-free operation of the engines.

Engine cooling is not by the direct system but rather by means of heat exchangers, fresh water only being circulated within the engine's water jackets and the heat exchanger coils, whereas the latter are cooled by sea water. Two 2-in. bronze fitted salt water circulating pumps, each mounted on a common sub-base with a 5-hp., 32-volt, 1,750 rpm. electric motor, supply cooling water to the heat exchangers.

No less than four air tanks, two 30 x 96 and two 20 x 60 hold air under pressure for starting the engine. A 24-volt Exide storage battery supplies current for the starting of the 20-hp. auxiliary Diesel engine, and the battery in turn is charged by means of a 24-volt generator, which is part of the auxiliary 20-hp. Diesel engine set.

The 1¼-in. centrifugal water circulating pump as well as the 1½-in. gear lubricating oil pump are driven by a 5-hp. double-end 32-volt marine type electric motor.

Two ½-hp. motor driven transfer pumps, one for the fuel and one for the lubricating oil, keep the engine supplied with fuel and oil. A Fairbanks-Morse automatic electric fresh-water system supplies culinary water and another Fairbanks-Morse automatic electric pump supplies water for the sanitary system.

A 10 kw. Electric Dynamic 32-volt tail shaft generator completes the elaborate auxiliary equipment as installed on board the *Cardinal*. It will be noticed that every pertinent need has been anticipated and the range of the equipment used is sufficient to satisfy all demands that may occur under diversified operating conditions.

Not only was the hull of the *Cardinal*, constructed in its entirety at the yards of Ira S. Bushey & Sons, Inc., but the engines, as well as the numerous auxiliary equipment, were installed at their shipyards, where complete facilities for such work as well as a staff of competent workmen are available.

Having built and operated steam driven tugs

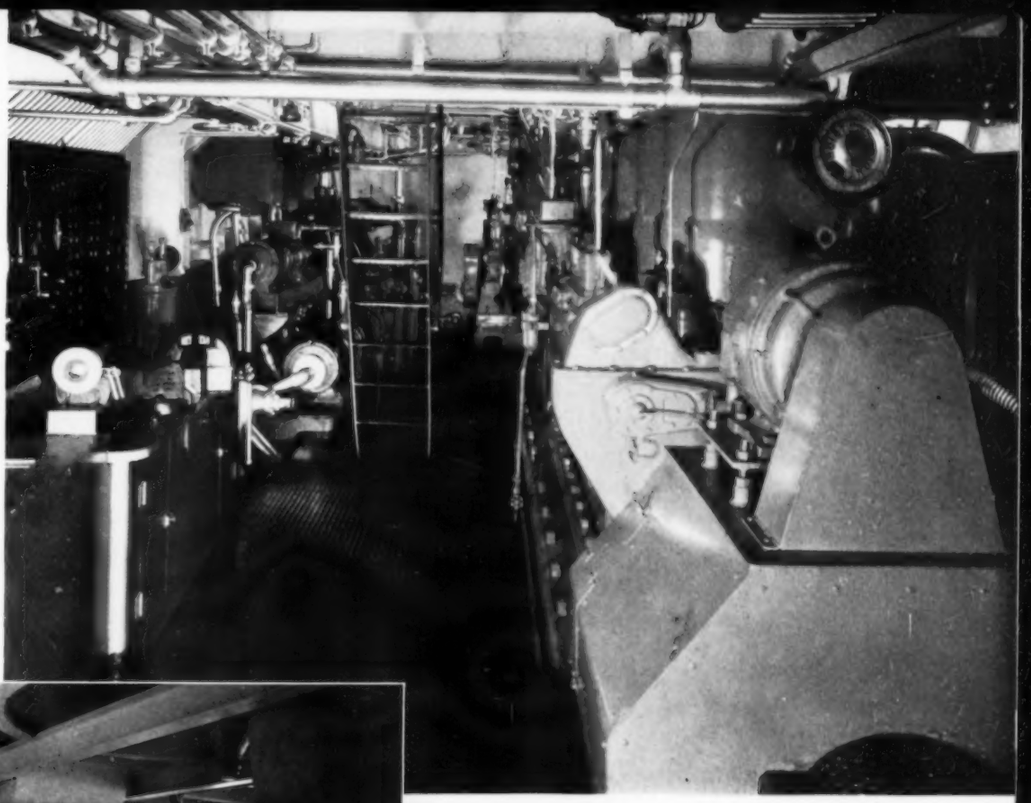


Fig. 1. View of the engine room, showing Fairbanks-Morse main propulsion engine with auxiliaries in the background.

Fig. 2. Control cabin, top view of main propulsion engine.

for years, it is significant that Ira S. Bushey & Sons, Inc., are completely sold on Diesel engines. The causes for this preference can readily be understood. Diesel-engined tugboats are "instantly available" whenever a call comes in for a tug. Whereas steam-engined tugs have to make frequent stops to take on water and coal, the Diesel-engined tug carries sufficient fuel for long journeys without stops.

The *Cardinal* is intended to ply not only the New York harbor but also those of New England, Providence, Boston, Portland, etc. For long cruises a triple crew of eight-hour watches, can be accommodated, since the crew's quarters are located in the superstructure and are sufficiently commodious to permit this.

Thus, the *Cardinal* is one of the most up-to-date tugs in New York harbor, incomparably superior to the old wooden steam-engined tugs.

Fig. 3. The Youngstown Miller oil purifier at the right, Fairbanks-Morse auxiliary machinery at the left.

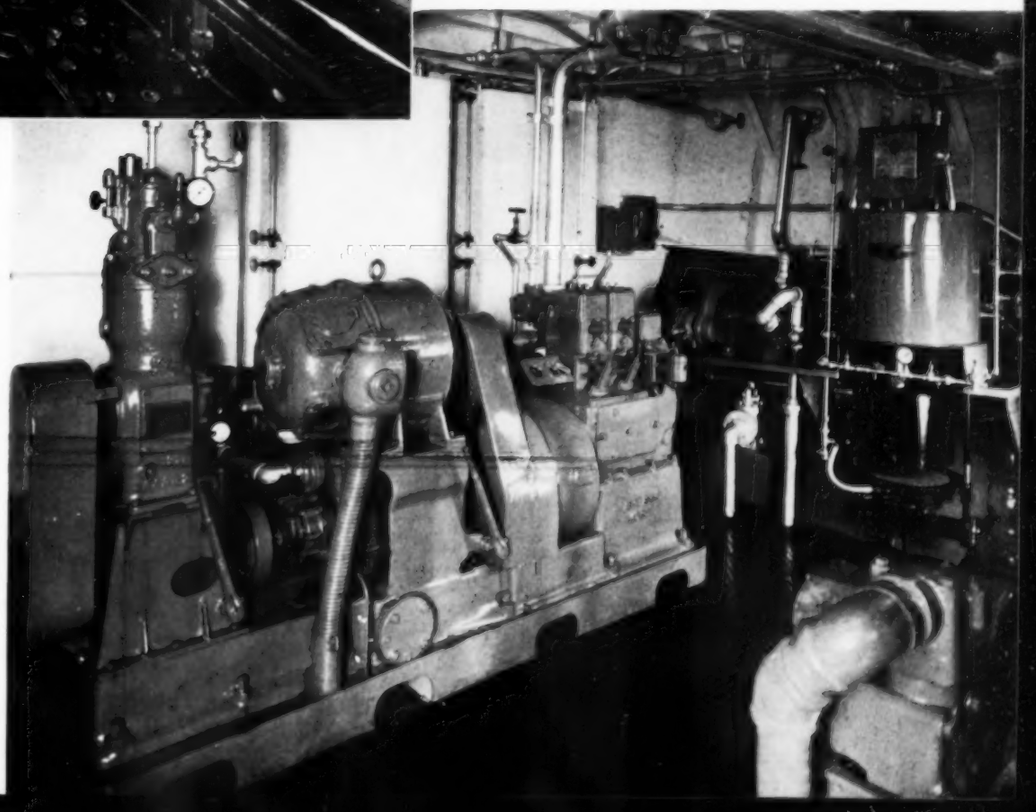


Fig. 1 – The Manor Pharmacy.

A DRUG STORE DIESEL PLANT

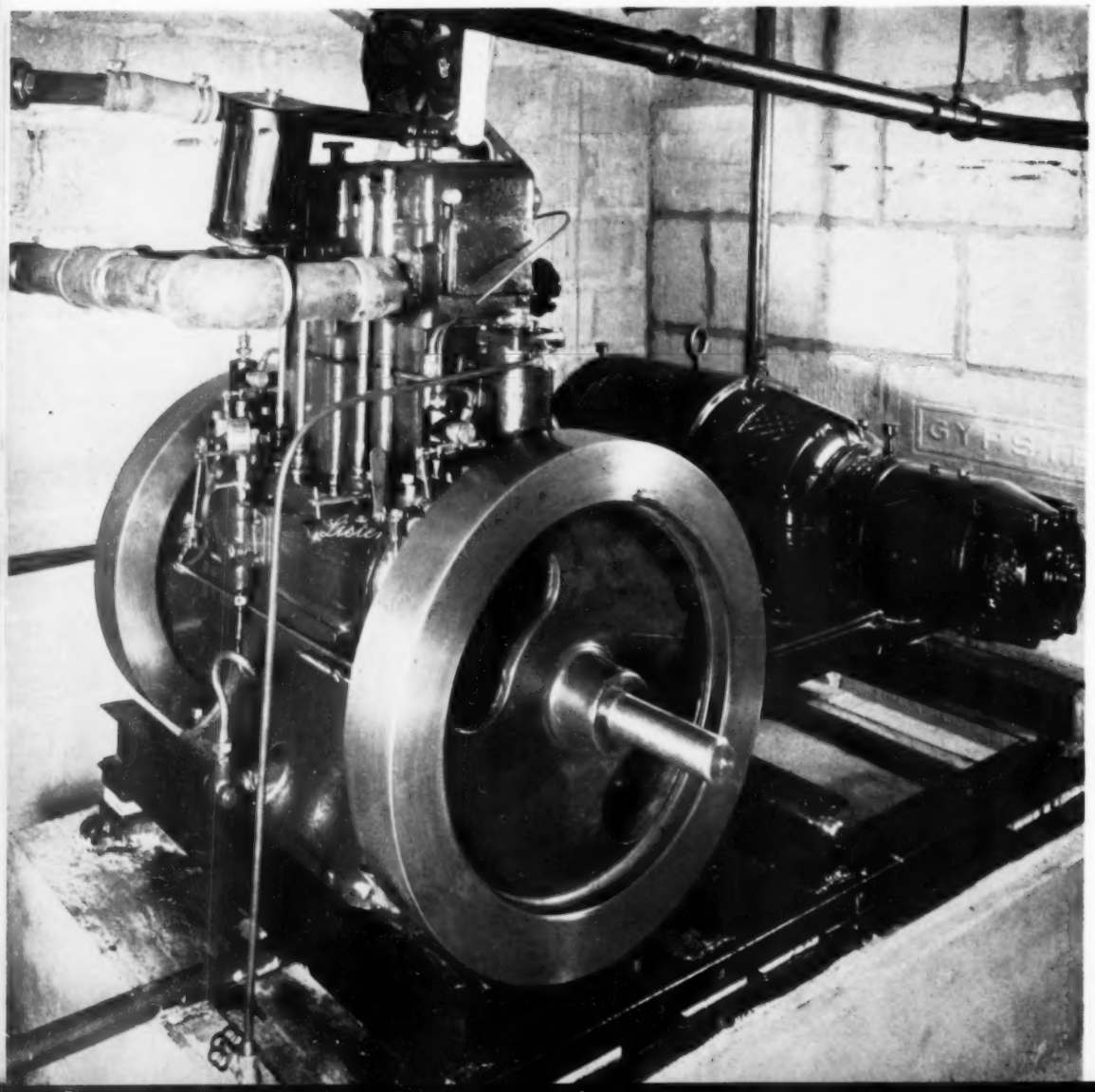
By B. J. VON BONGART

IT is stated – usually by those who fear the competition of the Diesel engine – that small Diesel installations do not pay and that they are, in fact, a liability and a waste of money. Now what are the facts? The story of the Manor Pharmacy at Pelham Manor, N. Y., provides the answer.

The Manor Pharmacy, Dr. P. V. Abarno, Proprietor, is not only a modern pharmacy, but it includes also fountain and restaurant services of a character one would expect in a neighborhood such as Pelham Manor.

The light and power requirements in a modern pharmacy are considerable indeed, and for the Manor Pharmacy the electricity used per month totaled amounts varying from $65 to $125, depending upon conditions. In addition, the hot water needed for the fountain and restaurant services required an outlay of some $15 per month for gas.

Dr. Abarno considered these outlays excessive and thus began to investigate the virtues of a Diesel-electric plant. He was duly warned – by those interested in discouraging such an effort – that small electric plants would not pay and, furthermore, that one who is leasing premises rather than owning them, would be foolish to invest good money in a Diesel plant.



However, paying 5c per kw. hour is too high a price and when the electricity used totals an average of $100 per month, then a Diesel-electric plant is the only solution. The success of any business enterprise depends upon the ability to eliminate useless and wasteful expenditures.

This issue motivated the installation of a modern Diesel-electric plant at the Manor Pharmacy. The plant consists of a twin installation, a 12 hp. 2 cylinder Lister Diesel engine of 4½ in. bore and 5½ in. stroke, Gates V-belt connected to a Star Electric 7½ kw. three-phase alternator with direct driven exciter, delivering 120/208 volts.

This is the larger set, used from about 5 P.M. to midnight. A smaller Lister Diesel, a 6 hp. single cylinder, driving a 3 kw. Star Electric 3 pahse alternator with an output of 120/208

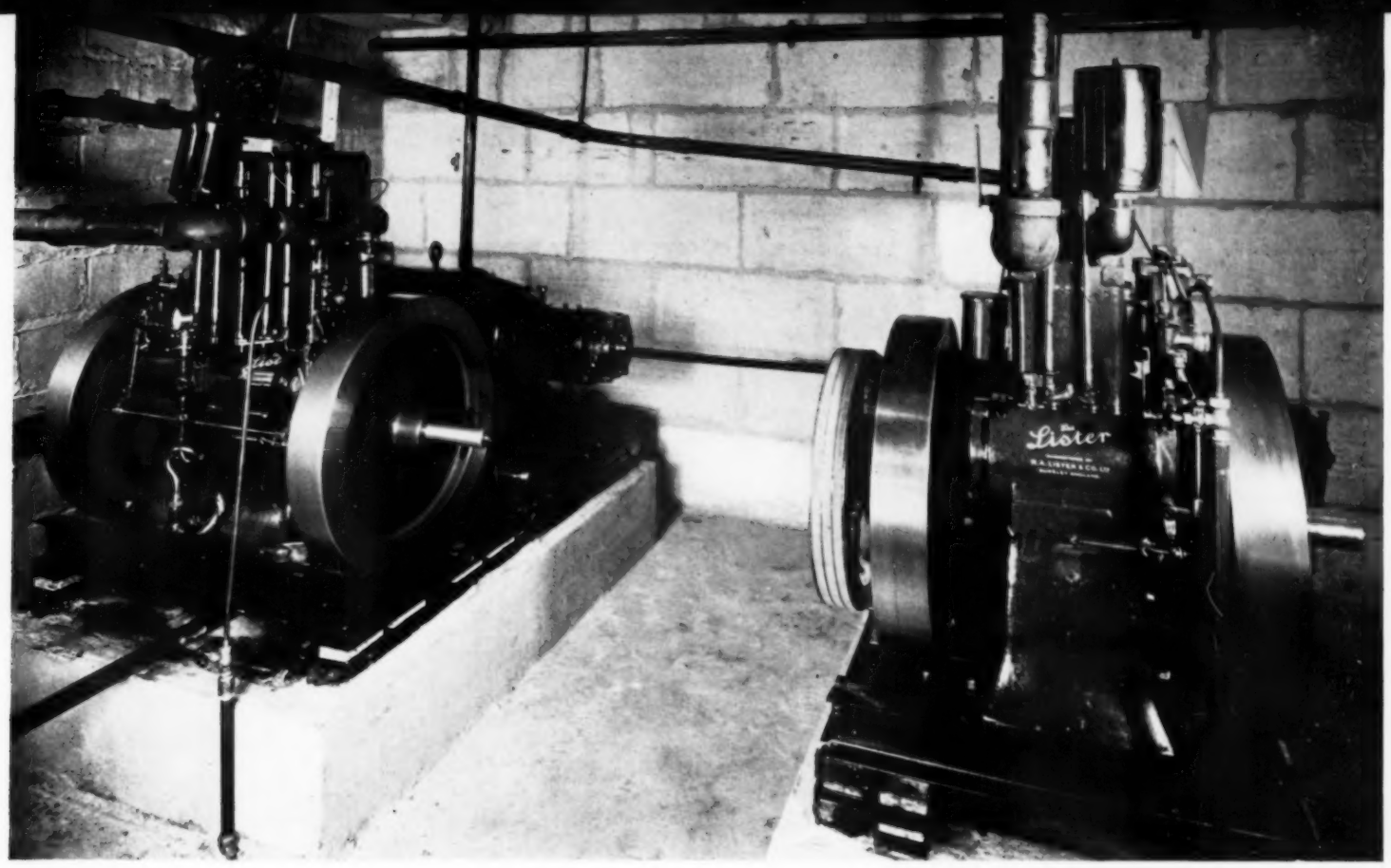


Fig. 2 – Manor Pharmacy power plant, two Lister Diesel-electric sets.

volts is used for the night and morning load, i.e., from midnight until the larger set is required, beginning at about 5 P.M. Having thus two independent Diesel-electric plants ready for service, there is no need for a stand-by tie-in with the public utility, and this in turn eliminates another needless expenditure.

The Lister Diesel engine is particularly well suited for small power users. These engines are readily started by means of a hand-crank, thus obviating air starting devices with their tanks and compressors, or electric starters requiring batteries and generators for the recharging of the batteries.

The Lister chamber construction, as shown in Fig. 3, is particularly helpful in starting the engine. This construction is essentially a dual-chamber type, employing a spherical combustion chamber into which the fuel is injected and where the combustion takes place, aided by an air chamber. The latter is normally open and is connected with the main spherical combustion chamber by means of a narrow passage. The compression pressure of the Lister Diesel, using both chambers, is from 400 to 450 lbs. per sq. in. For starting purposes, the control valve is screwed inward so that it seats over the opening between the combustion and the air cell, entirely closing off the latter. This raises the compression pressure to approximately 600 lbs. per sq. in. or sufficiently high to give positive and prompt ignition when starting the cold engine. After but a few minutes' operation, the engine warms up and the control valve may be opened to give lower compression pressures and hence long engine life.

The engines are equipped with Bosch fuel pumps and nozzles. A Burgess silencer muffles the exhaust so that customers in the store are unaware of the fact that a Diesel engine is operating in the basement. The engines are mounted upon bases furnished by the Vibration Eliminator Company.

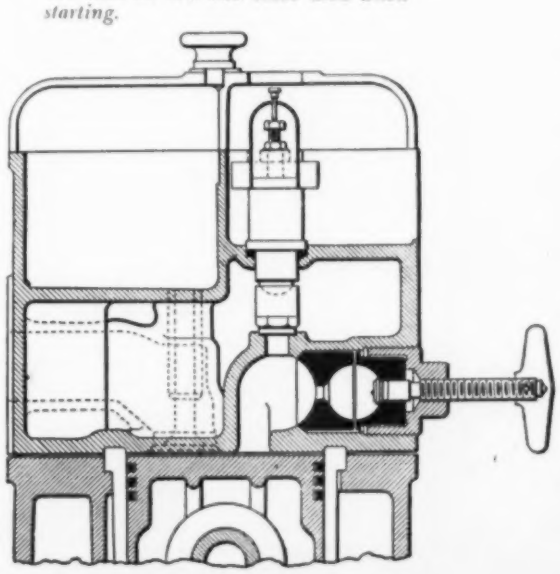
The electric equipment includes Seaboard Electric Switchboard and Weston meters, Ward-Leonard field rheostats and Star Automatic voltage regulators.

The engines are cooled by means of heat exchangers, surrounded by a 250 gallon water tank. The latter thus furnishes more than enough hot water for the fountain and restaurant services incidental to the operation of the drug store. Whereas inadequate hot water service formerly has cost no less than $15 per month, ample hot water is now furnished cost-free, thanks to the Diesel engine.

The total cost of the Diesel-electric plant at the Manor Pharmacy was approximately $3,500. The savings accruing from operation total $135 per month ($120 savings in electricity cost, $15 for heating gas are eliminated since the Diesel engine now furnishes hot water free) or $1,650 per year.

Thus, the Diesel-electric plant pays for itself in a little over two years, and after that period it will be a source of income for years to come. The Diesel plant at the Manor Pharmacy furnishes a concrete example that so-called small plants are not only economically feasible, but are also a source of substantial revenue to operators. And, furthermore, ownership of the premises is not at all necessary; any business enterprise occupying premises under a long lease is fully justified in adopting the Diesel engine as a source for light and power, since such installations pay for themselves within almost incredibly short times – hence are an asset and not a liability.

Fig. 3 – Section through the cylinder head, showing the combustion chamber with air cell and valve used when starting.



THE NICKLED-LINED TANKER "DOLOMITE 4"

By B. J. VON BONGART

A NEW and unusual ship which, its owners believe, may completely revolutionize ocean-lake traffic is the *Dolomite IV*, built at Pittsford, near Rochester, N. Y.

While the ship embraces novel ideas, its method of construction was totally unorthodox. The keel was laid in a dry spur of the old Erie Canal at Pittsford; she literally never was launched but rather floated after completion by syphoning water into the lock until the *Dolomite IV* rose from the hull's supports. This new novel ship was duly christened in the traditional manner with champagne by Mrs. Henry Kondolf of New York City.

It is a twin screw Diesel-engined ship, 300 ft. long with a beam of 43 ft. 4 in. and a moulded depth of 20 ft., built to full ocean classification under Lloyd's rating.

The hull is made up entirely of electrically welded steel channels bent to form the main structure, there being no rivets. In order that one may visualize the magnitude of this welding job, it may be said that no less than 40 miles of welding were required.

The gross tonnage is 5,500 and the hull has five main bulkhead cargo tanks lined with sheet nickel, which is spot welded to the frame and arc welded on the seams. It is said that the *Dolomite IV* is the first freight ship to feature nickel cargo tanks. It may be said in passing that over 60,000 lbs. of sheet nickel was used to line the main tanks.

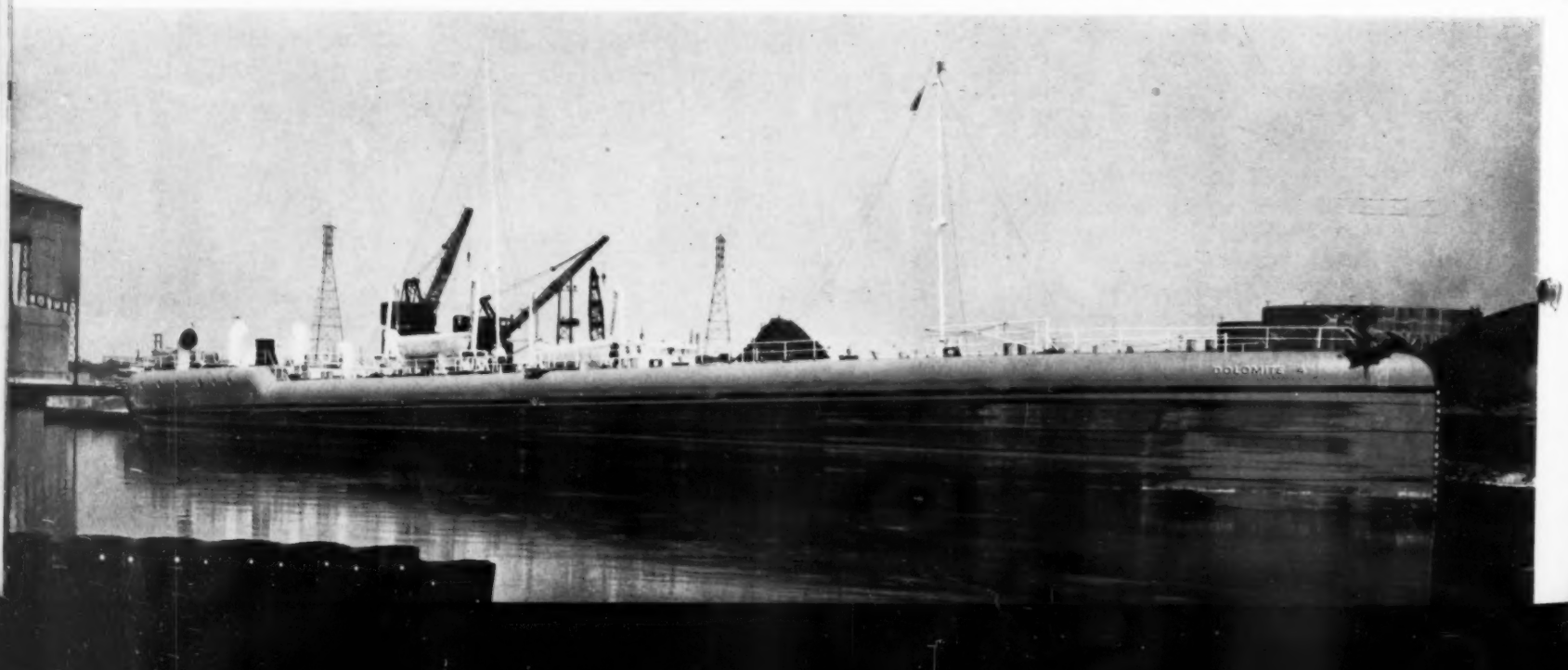
The advantages of nickel clad steel construction are manifold. It permits the bulk shipment of corrosives and a change-over from a wet to a dry cargo may almost immediately be made after unloading. Cargoes such as kerosene, lye, oil, etc., would ordinarily render the holds unfit for carrying any other sort of commodities, but the nickel-clad holds of the *Dolomite IV* may readily receive shipment of grain in bulk after the shiny walls of the holds have been cleaned with steam jets. Such a cleaning does not even leave an odor; hence the holds are fit for carrying food cargoes irrespective of what the previous cargo might have been.

The vessel is powered with two Alco 8-cylinder 4-cycle Diesels 12½ x 13, of 720 hp. at 600 rpm. A Farrel-Birmingham reduction gear gives a propeller speed of 300 rpm.

The engines are mounted starboard and port in the customary manner and are accessible from all sides. Aside from the engine room and fuel tanks, the entire hull of the *Dolomite IV* can be used for cargo space, which means that the latter is of large net tonnage for a ship of its size.

On its maiden voyage from Oswego, N. Y., to East Chicago, Ill., the *Dolomite IV* delivered a cargo of 1,000,000 gallons of kerosene at the Hughes Oil Company piers. After unloading the kerosene, the boat proceeded to South Chicago and, after a steam cleaning of the holds, took on a cargo of wheat for shipment to New York City. It was said that this was the first time that kerosene was shipped in bulk by water, since it corrodes the metals customarily used in cargo tank construction, thus becoming discolored. In addition, once a hold has carried strongly odorous liquids, it becomes totally unsuitable for food cargoes. The nickel clad holds of the *Dolomite IV*, however, are not subject to such limitations and lake men say that the success of this boat will inspire construction of many new vessels of a similar type.

The Diesel-engined "Dolomite" delivering kerosene in bulk at Chicago.



Above – The "Dolomite" is launched by syphoning water into the dry arm of the old Erie Canal.

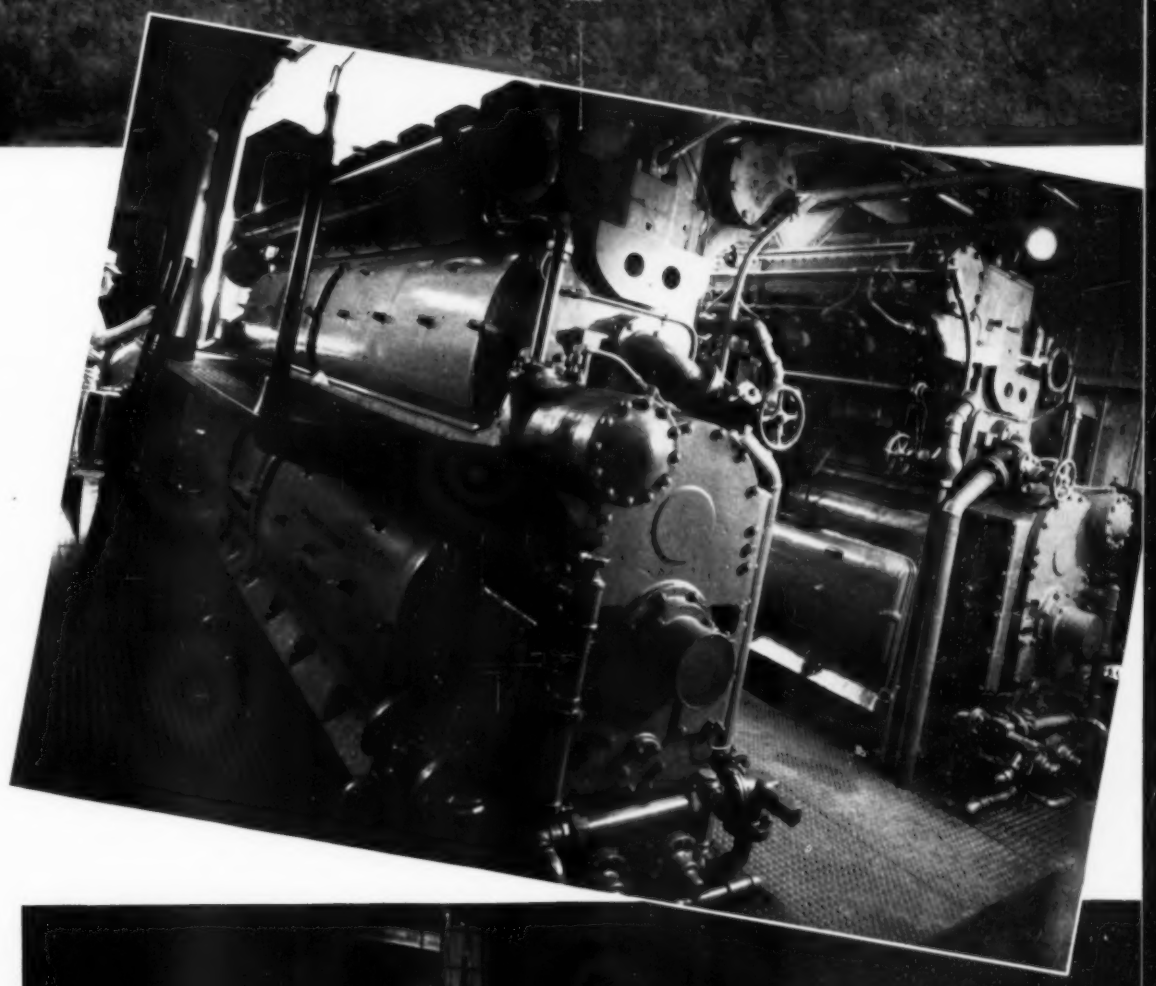
Right – The two Alco four cycle, 720 hp. Diesels of the "Dolomite."

Mr. John H. Odenbach, President of the Dolomite Corporation of Rochester, N. Y., builders and operators of the *Dolomite IV*, stated that the boat will continue to carry kerosene one way and grain the other way.

After November, or as soon as winter closes down on lake shipments, the *Dolomite IV* will ply the gulf ports, carrying lye between Lake Charles, Louisiana, and Norfolk, Virginia. The cargoes may alternate in this service with molasses, oil, grain or other products.

The full significance of the *Dolomite IV's* construction is well appreciated by lake men, and it is said in shipping circles that for years owners of vessels have endeavored to find some method by which a carrier could make a quick shift from wet to dry cargo or from odorous minerals and liquids to foodstuffs. The sheet nickel-clad holds seem to be the solution to this pressing demand.

It is safe to predict that the performance of this novel Diesel-engined cargo ship will be watched with interest and that its manifest success will inspire the construction of many similar vessels. The *Dolomite IV* is now the largest electrically welded Diesel-engined ship on the Great Lakes.



Cleaning and de-odorizing the nickel clad holds of the "Dolomite" after delivering kerosene in bulk. This procedure prepares the holds to take grain in bulk without detrimental effects to the grain.

CUMMINS DIESEL

"JOB-TEST EVIDENCE"

The Cummins Diesel is applying to you for a job . . . an opportunity to demonstrate that it can save money for you. Like any other competent workman, it invites a thorough investigation of its record . . . a check of its "job-test evidence" . . . where it is working . . . what it is doing . . . not alone on jobs similar to your own, but in *all* varied applications.

Cummins Diesel "job-test evidence" is your assurance when buying a diesel engine for your shovels, compressors, pumps or dump trucks.

CUMMINS ENGINE CO., 2312 WILSON ST., COLUMBUS, IND.

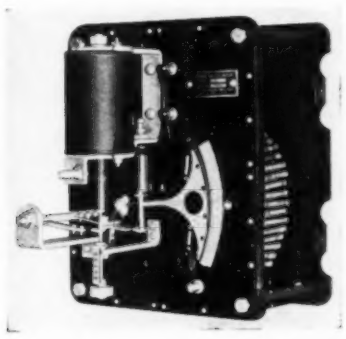
Maximum economy is assured this contractor who standardized on the Cummins Dependable Diesel for powering both the shovel and the dump truck.

CUMMINS
Dependable
DIESEL
PIONEER IN MODERN DIESEL DEVELOPMENT

HILL TRANSFERRED

THE United American Bosch Corporation of Springfield, Mass., announces that Mr. H. O. Hill, a member of its staff of Diesel Injection Equipment Engineers, has been transferred from the Chicago territory to Detroit and that in the future, Mr. Hill will make his headquarters at the American-Bosch branch there.

ALLIS-CHALMERS MFG. COMPANY'S Switchgear Division, Milwaukee, Wis., has come out with a new simple, inexpensive "Rocking Contact" type voltage regulator, known as their type V-O, designed for automatic voltage control of small alternating and direct current generators. This proven design of regulator was heretofore available only in the larger, more expensive Rocking-Contact-Principle regulators. This same principle being incorporated in the new V-O regulator, it is very quick acting, regulating the voltage by directly varying the resistance in the field circuit.



There are no vibrating contacts, tubes or other parts requiring replacement or readjustment at frequent intervals. An attractive metal enclosing case excludes dust and other foreign matter, thereby reducing maintenance. Only two simple adjustments to be made at the time of installation, since all major adjustments are made at the factory.

The type V-O regulator consists of a sensitive solenoid actuated plunger which acts upon a main shaft, rocking a special carbon rimmed contact sector over the inner surface of a commutator, the segments of which are connected permanently to the regulating resistance. The segments are heavily silver plated in order to insure positive contact surface, and are insulated one from another and solidly held in place on a specially constructed base to prevent any disalignment through years of service.

The regulator is of small dimensions and suitable for either switchboard or wall mounting. Descriptive Leaflet No. 2326 may be obtained from the Switchgear Division of Allis-Chalmers Mfg. Co., Milwaukee, Wis.

The luxurious Elco Motor Yacht 53

New Diesel motor yachts and cruisers

• Pioneers in the application of Diesel power in the cruiser field, The Elco Works offers a wide range of beautiful yacht and cruiser models with this modern type of power.

Elco has been outstandingly successful in making Diesel installations, even in smaller cruisers, thanks to its patented "Vibrationless Power" system of mounting the engine assembly in live rubber. Elco's "Vibrationless Power" mounting is considered almost as a "must" in Diesel installations by many experts. Its contribution to your cruising pleasure must be experienced to be really appreciated.

For full details on Elco's new Diesel motor yachts and cruisers and on Elco's "Vibrationless Power" write today to Port Elco.

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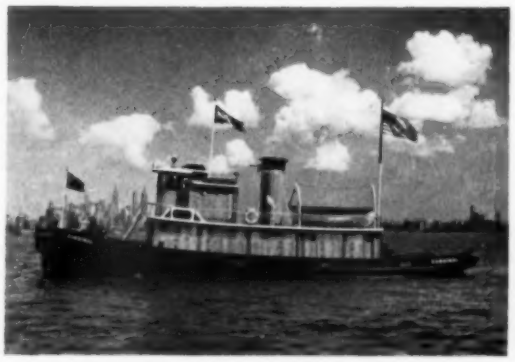
ELCO CRUISERS, INC., County Causeway, Miami, Florida

IT'S A MAXIM SPARK ARRESTOR SILENCER

ON THE

NEW BUSHEY TOWBOAT

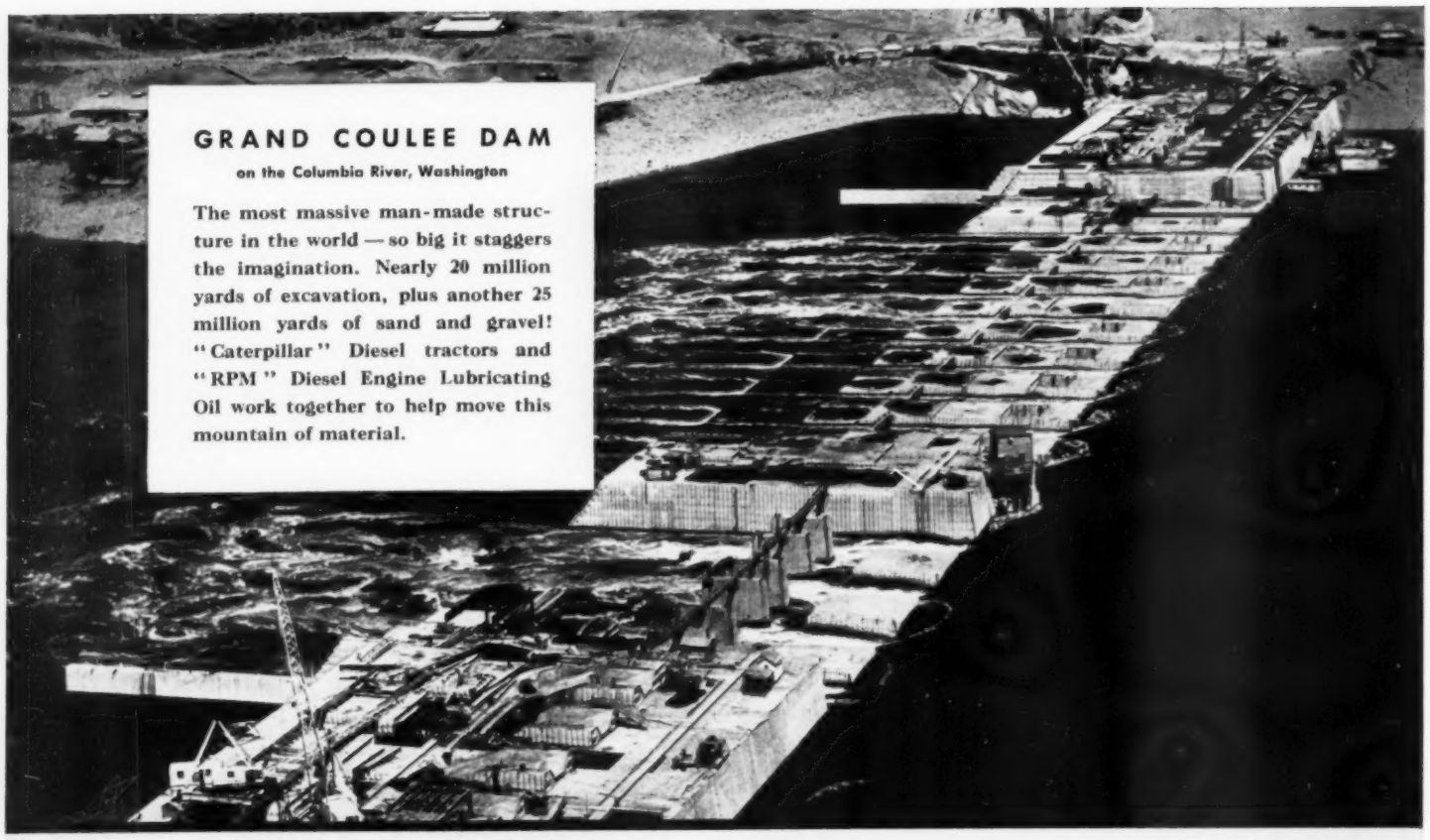


MOTOR TUG "CARDINAL"

"CARDINAL", the new Bushey towboat, represents the finest in design, material and workmanship. For the exhaust, more than just spark arresting was required; the exhaust noise had to be reduced to a minimum. A Maxim SC2 spark arrestor silencer was selected because of its superior silencing as well as its efficient spark arresting characteristics.

THE MAXIM SILENCER COMPANY

HARTFORD, CONNECTICUT NEW YORK, N. Y.



GRAND COULEE DAM

on the Columbia River, Washington

The most massive man-made structure in the world — so big it staggers the imagination. Nearly 20 million yards of excavation, plus another 25 million yards of sand and gravel! "Caterpillar" Diesel tractors and "RPM" Diesel Engine Lubricating Oil work together to help move this mountain of material.

WORLD'S BIGGEST CONSTRUCTION JOBS

cut costs with "RPM" Diesel Engine Lubricating Oil

"RPM" Diesel Engine Lubricating Oil is on the job in "Caterpillar" Diesel tractors moving millions of yards of dirt at the Grand Coulee Dam because—

It eliminates carbon troubles—

It prevents ring-sticking—

It lubricates smoothly hour after hour under the toughest working conditions.

The tractors at this giant dam have operated as long as 10,000 hours between overhauls—an almost unheard-of feat before the discovery of "RPM" Diesel Engine Lubricating Oil. This famous lubricant means money-saving performance for *your* "Caterpillar" Diesel equipment, too. Put it to work—now.

STANDARD OIL COMPANY OF CALIFORNIA

RPM

REG. TRADE MARK

DIESEL ENGINE LUBRICATING OIL

Approved by
CATERPILLAR TRACTOR CO.

RPM
DIESEL ENGINE LUBRICATING OIL

A truly modern oil that does more than lubricate perfectly

On construction jobs, in power plants, in the woods and on the farm, "RPM" Diesel Engine Lubricating Oil is helping Diesel tractor owners to earn more profits.

It is made to prevent ring-sticking, reduce non-operating hours and end overhauls for carbon removal. When drained it removes dirt and carbon which it holds in suspension.

If your equipment is "Caterpillar" Diesel, this is *your* oil. "RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

IN THE UNITED STATES

"RPM" Diesel Engine Lubricating Oil:
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THE CARTER OIL COMPANY, Tulsa, Oklahoma
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF TEXAS
UTAH OIL REFINING COMPANY

Diol "RPM" Diesel Engine Lubricating Oil:
COLONIAL BEACON OIL COMPANY, INC.
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL COMPANY OF PENNSYLVANIA

Signal "RPM" Diesel Engine Lubricating Oil:
SIGNAL OIL COMPANY

Sohio "RPM" Diesel Engine Lubricating Oil:
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"RPM" Diesel Engine Lubricating Oil:
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"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

Get in touch with your nearest distributor—for a clean engine, and long hard service with the minimum of overhaul.

DIESEL DEVICE FROM WAUKESHA LABORATORIES

A New Nozzle Tester

Designed by Waukesha's Research Staff

THE latest product of the Waukesha Motor Company's Fuel Research Laboratories, one for which patent applications have been made, is a new precision tool for Diesel engine nozzle testing that is intended for both laboratory and service station use, as well as for fleet owners.

It is claimed for this device that no special skill is required to make accurate adjustment and test of every standard make of injection nozzles – Allis-Chalmers-Deco, Bendix, Bosch, Caterpillar, Hesselman, Timken and many others less well known.

As builders of the famous C.F.R. octane rating engine, adopted by the U. S. Bureau of Standards and the American Society for Testing Materials as the sole instrument for gasoline rating, this staff of fuel experts has had a persistent demand from Diesel engine operators for a simple, accurate instrument to check, test and adjust Diesel nozzles that could be used in routine maintenance work.

The need for such a device comes from the fact that satisfactory performance of any injection engine is so vitally tied to proper and uniform nozzle condition that hardly any other one factor equals it in importance. It is much more sensitive than proper spark plug adjustment in a gasoline engine.

Waukesha Diesel and oil engine nozzle tester showing simple micrometer adjustment for checking nozzle pressures.

With the Waukesha Diesel Nozzle Tester it is easily possible to detect clogged nozzles by the unsymmetrical pattern of the spray. This is one of the commonest difficulties and results in rough, uneven running of the engine, extravagant waste of fuel and often in mechanical damage to bearings and other parts of the structure, particularly if the nozzle fails to atomize the charge and it enters the engine in a solid stream. Besides this such a condition promotes both smoky exhaust and crankcase dilution with all the chain of other operating difficulties that follow – stuck rings and scored cylinders, overheating, loss of power and early fouling of oil filters.

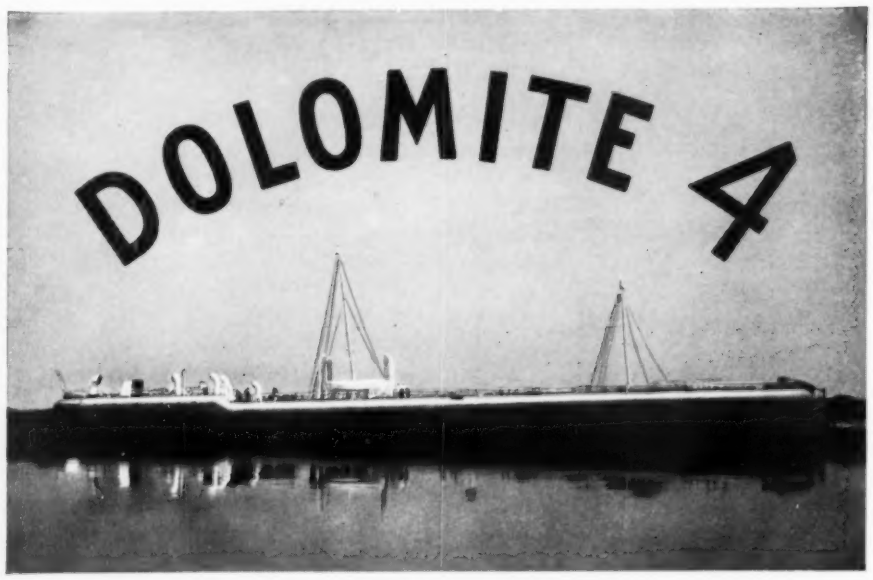
The greatest advantages of the Diesel engine cannot be realized, say Waukesha engineers, until the technique of routine servicing has been developed and the tools made available.

With this tool it is easy to determine both the spring pressure and correct adjustment, the quality and pattern of the spray, the condition of the valve seat and amount of dribble or leakage, stuck needle valves and other irregularities. Once these defects, not readily detectable by the driver, are discovered they can easily be corrected.

It is recommended by most Diesel experts that nozzle inspection be made a part of the routine of maintenance the same as oiling and greasing, since the most experienced operators have found that it forestalls more serious difficulties on the road.

As shown in the illustration, the Waukesha

. . . . *And now please turn to page 52*



ALSO equipped with

dual purpose

Electrical R. P. M. Indication

Like Dolomite 2, this new motorship has been WESTON equipped to provide the dual advantages of electrical R.P.M. indication:

1. Engine speeds shown on the dial will be dependable, because of the simplicity and inherent accuracy of electrical indication.
2. Engine room response to bridge signals will be immediately indicated on the dial, because the response of the electrical indicator to any change in engine speed is *instant*, and *smooth*.

Ease of installation, and low maintenance, also distinguish electrical indication. Mounting a small magneto and wiring it to one or more indicators is a quick, simple task. And because there is no flexible shafting, and a very minimum of wearing parts, long, low-cost service is assured. Full particulars relative to WESTON R.P.M. indication are available. Send for literature. Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark, New Jersey.

WESTON Indicators are available in various sizes and shapes, with scales calibrated in any range of R.P.M.

WESTON *Instruments*

NEW NOZZLE TESTER

. . . . *Continued from page 51* . . . .

nozzle tester consists of a hydraulic pump element operated by a long hand lever. Fuel oil used for testing is contained in the horizontal cylinder directly below the operating lever which forms a reservoir with a capacity of approximately one pint. It is filled through the funnel shown at the left with the same kind of Diesel fuel oil as used in the engine. This oil is delivered to the pump element through a filter to prevent foreign matter from entering the hydraulic unit or the nozzle under test. Fuel is forced by the pump through the high pressure injection tubing and discharged from the nozzle into the funnel and thence returned to the reservoir and re-circulated.

A balanced by-pass valve connects the delivery passages drilled in the malleable iron pump head with a return port leading to the oil reservoir. By controlling the spring tension on this by-pass valve, the pressure in the nozzle line may be adjusted with great accuracy for any required nozzle setting.

This adjustment is accomplished by the knurled micrometer head shown in the illustration. One complete revolution changes the discharge pressure 100 pounds. Graduation on the head itself permits settings at 10 pound intervals by the calibrated thimble while 5 pound adjustments are easily estimated because the graduation marks are liberally spaced around the barrel.

All high pressure parts are substantial, durable, malleable iron, heat treated steel, and chromium plated brass being used throughout. Ordinary wear, even after testing tens of thousands of nozzles, has no effect on the accuracy of this instrument. The entire equipment weighs less than 20 pounds and is furnished with high pressure injection tube connector and fittings, chromium plated funnel, and full instructions. The list price is $35.00.

COLUMBIA ELECTRIC MFG. COMPANY, Cleveland, Ohio, has recently developed a new type of controller for use with low voltage high amperage generators where a very close control of the voltage is required. Particularly for laboratory use, it replaces the standard field rheostat and separate exciter. For example on a 6-volt generator where it is frequently required to use voltages between 0 and 6 volts, this controller will enable the operator to set the voltage at any point within .1 of a volt. Further details will be sent on request.

A NEW book on Diesel Engineering has just been published, entitled *Diesel Engines*. It is by B. J. Von Bongart, technical editor of DIESEL PROGRESS.

This book gives in full the fundamentals of Diesel engine design and operation – from a broad point of view that comprehends both American and European experience. It places particular emphasis upon the factors that play so great a part in design – such as combustion, combustion chambers, fuel atomization, injection nozzles and pumps. It presents the necessary scientific and engineering background – thus the thermodynamics of the Diesel engine, and internal combustion engine cycles are treated at sufficient length to serve as a review, or to permit use of this text by those who have not previously studied thermodynamics or internal combustion engines.

As a text, it has many points of interest, from both the pedagogic and the engineering standpoints. It begins with a detailed history of the development of internal combustion engines preceding the Diesel engine. The subject of combustion of hydrocarbons in a Diesel engine is treated so as to show the fundamental combustion reactions, and also show the effects of excess air, density of the air and injection timing. Fuel oils, both petroleum and vegetable, are discussed with particular reference to their ignition temperatures and qualities. The various methods of rating ignition qualities of fuel oils are explained. Stressing the importance of fuel atomization this book discusses fully the interrelation of injection pressure, compression pressure and nozzle design.

The book provides a great amount of fundamental and specific engineering information. The various types of combustion chambers – open, ante, turbulent and air cell – are described and their relative merits are stated in a manner free from bias. Three chapters are devoted to automotive, aircraft, medium and low speed Diesel engines ranging from A.E.C. to Z.O.D. The various type of superchargers are described, and their advantages are shown by result of comparative tests. The final chapter is devoted to a discussion of the trends in design of various engine parts, particularly in the ways they vary from the conventional gas or gasoline engine.

The book is profusely illustrated and is of value to the engineer, mechanic or salesman, as well as to the Diesel engine user and student. Copies of the book *Diesel Engines* by B. J. von Bongart can be obtained by remitting $5.50 to DIESEL PROGRESS, 2 West 45th Street, New York, N. Y.

HOIST EQUIPMENT

MODERN DESIGN — HIGH QUALITY

5 Types of Hand Hoists
3 Types of Electric Hoists
5 Types of I-Beam Trolleys
Many Standard Types of Cranes

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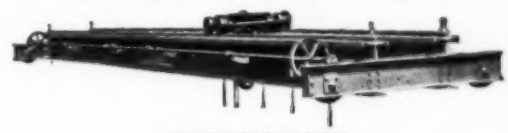
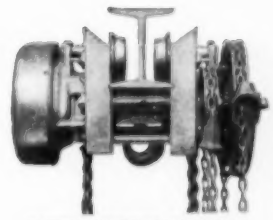
CHAIN HOISTS


TRAVELING CRANES

PULLER

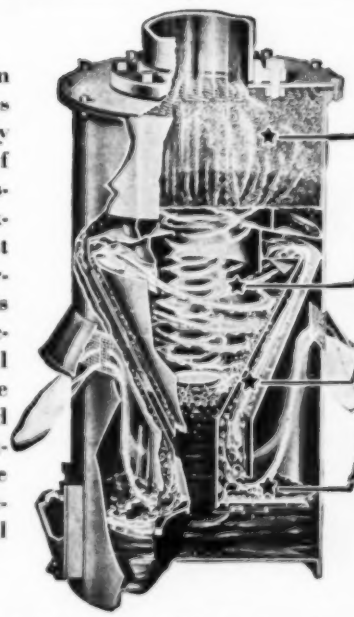
ELECTRIC HOISTS

I-BEAM TROLLEYS


LOW HEADROOM HOISTS

AMERICAN *Cycoil* THE OIL BATH AIR FILTER WITH 4 WAY CLEANING

• The American Cycoil air cleaner was developed especially for the protection of engines and compressors subjected to extremely heavy dust concentrations. Incorporated in the Cycoil is a new precleaning action by which an oil spray mixes with the incoming air and passes into a precleaning chamber where the bulk of the dust is removed by centrifugal action.



• The four distinct cleaning operations listed above are available only in the Cycoil Oil Bath Cleaner. Such a combination assures a continued self cleaning action.

Write for Bulletin No. 130A for Complete Information

AMERICAN AIR FILTER CO., INC., INCORPORATED
112 CENTRAL AVE., LOUISVILLE, KENTUCKY

Judge the value of

HEMPHILL-TRAINED DIESEL MEN

from these typical graduates:

CHIEF ENGINEER	"I am holding my second position as Chief Engineer."—B.C.F.
FACTORY REPRESENTATIVE	"After completing my course I was employed as factory representative."—C.L.
FITTER	"I am on my fifth month as a fitter in the parts and assembly department."—G.R.C.
OPERATOR	"I am installing and operating their ten unit plant."—C. G.L.

For capable Diesel men call on

HEMPHILL DIESEL SCHOOLS

Consult or write our employment directors at any of our schools:

NEW YORK CHICAGO SEATTLE
BOSTON MEMPHIS LOS ANGELES
DETROIT VANCOUVER, B. C., CANADA

m-5-dpr

BERMUDA BUYS

THE Bermuda Electric Light, Power & Traction Company, Hamilton, Bermuda, recently placed an order with the Nordberg Manufacturing Company for a 3,180 hp. solid injection crosshead type Diesel engine to drive a generator to augment several Diesel engine units which they are now operating.

The existing units are all of foreign manufacture, practically all English Electric. This will be the first American-built Diesel engine in this plant which supplies the power for the entire Island. Nordberg has worked on this job for quite a number of years and finally was able to get an order for this large engine. The type of engine is exactly similar to the units which they are building for Tampa Shipbuilding & Engineering Company for Maritime Commission, and also similar to the engine which they are building for U. S. Indian Irrigation Service at Coolidge, Ariz. The U. S. Indian Irrigation and Bermuda engine will be built in eight cylinders, while, of course, the Maritime engines are built in nine cylinders.

Mr. A. R. McMullin of Nordberg's New York office worked up and closed this big deal.

A NEW booklet dealing with ball and roller bearing lubrication has just been published by The Texas Company.

The subject matter is treated in an elaborate manner, embracing such features as lubricating values, cause and effect of oxidation, durability of greases or rather their resistance to breakdown.

To assist the users of lubricants in choosing the proper grease or oil for given speed and temperature conditions, a schedule of Texaco lubricants especially compounded to successfully meet different service demands is also included.

The recommendations made are based upon extensive tests made by Texaco lubrication engineers using the Grease Breakdown Machine developed by The Texas Company for the observing of grease performance in ball bearings.

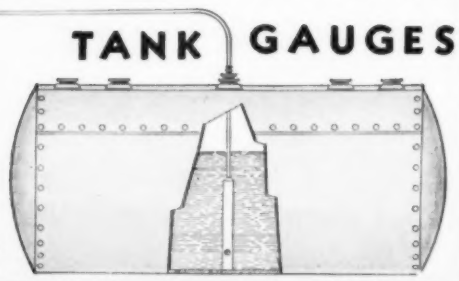
The booklet is profusely illustrated and gives a large number of practical ball and roller bearing installations, together with approved methods to provide adequate lubrication in any given case.

DIESEL POWER—Engines, Generator Sets, Complete Plants
Auxiliaries, Equipment, Service, Supplies, Conditioned, Rebuilt—Guaranteed · Engineering, Sales, Installations
A. G. SCHOONMAKER CORPORATION
36-44 HUDSON STREET Telephone BErgen 4-5300 JERSEY CITY, N. J.

PETROMETER DISTANT READING

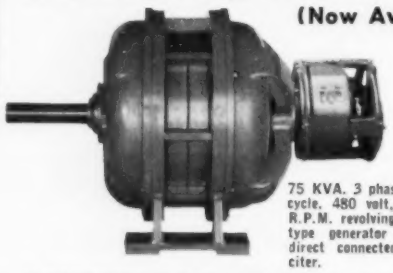
For the BEST DIESEL INSTALLATIONS

TANK GAUGES



PETROMETER CORP.
1 Star Sq., Long Island City, N. Y.

COLUMBIA A. C. GENERATORS
(Now Available with Automatic Voltage Adjusters)



75 KVA. 3 phase, 60 cycle. 480 volt, 900 R.P.M. revolving field type generator with direct connected exciter.

SIZES
1 to 156 KVA
SPEEDS
1800, 1200, 900, 720, 600 R.P.M.
SHIPMENT
One Week to 10 Days
Liberal Resale Plan to Dealers and Engine Manufacturers

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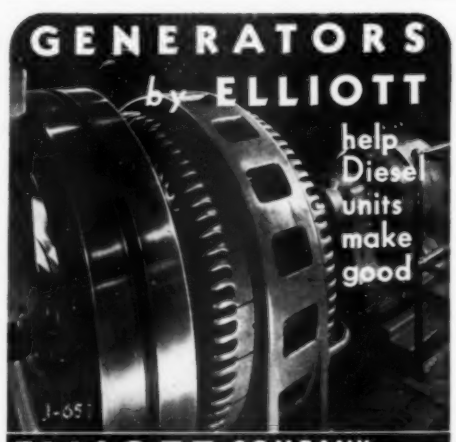
NORDBERG
DIESEL ENGINES
STATIONARY—MARINE

Two Cycle Type
750 H. P. upward

Four Cycle Type
600 to 1500 H. P.

NORDBERG MFG. CO.
MILWAUKEE, WIS.

GENERATORS by ELLIOTT



ELLIOTT COMPANY PITTSBURGH, PA.
Electric Power Dept., RIDGWAY, PA.

SAVES $59.67
Each Month with

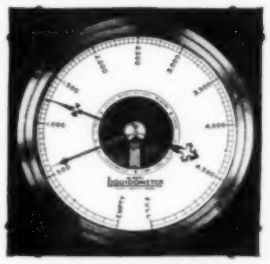
The Brewington Super Service Station, on the Tulsa road South of Kansas City, report that their STOVER DIESELS produce power and light 24 hours per day for $59.67 less per month than their former cost. STOVER DIESELS—

1. Reduce power costs 75% by using less and lower priced fuel oil.
2. Quickly brought to full load from a cold start in any weather.
3. Smooth, quiet, continuous flow of power without smoke or vibration.
4. Simple, positive, complete fuel combustion, without expert attention.
5. Compact and sturdy with all parts, except flywheel, enclosed and running in oil.
6. Semi-portable, with all parts easily accessible for adjustment or replacement.
7. Balanced for marine service. Dependable under worst conditions. Eliminate fire hazard.

Get facts and figures covering many ways STOVER DIESELS will cut power costs for you. Write Dept. DE-64 for new Diesel Bulletin.

DISTRIBUTORS A few profitable territory franchises still are open

STOVER MFG. & ENGINE COMPANY
FREEPORT, ILLINOIS, U. S. A.



Check your fuel Supply at a Glance!

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PRECISION BEARINGS
BALL • ROLLER • THRUST
for every load, speed and duty
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CENTRIFUGAL PURIFIERS
For fuel and lubricating oils
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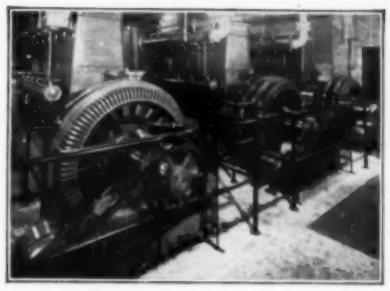
DIESEL PROGRESS

INDEX OF ADVERTISERS

	PAGE
Aluminum Co. of America	7
American Air Filter Co.	53
American Hammered Piston Ring Co.	5
Atlas Imperial Diesel Engine Co.	11
Bauer & Co., Frank	56
Brodie System, Inc.	55
Buckeye Machine Co.	55
Caterpillar Tractor Co.	15
Chisholm-Moore Hoist Corp.	53
Columbia Electric Mfg. Co.	54
Cooper-Bessemer Corp.	Fourth Cover
Cummins Engine Company	48
Delchanty Institute, The	56
Diesel Dynamics Corp.	55
Elco Works	49
Elliott Company	54
Erie Forge Co.	19
General Electric Co.	8
General Motors Sales Corp.	2-3
Goulds Pumps, Inc.	55
Hemphill Diesel Schools	54
Carl Hussman	Third Cover
Illinois Testing Laboratories, Inc.	55
Liquidometer Corp., The	55
Macmillan Petroleum Corp.	56
Maxim Silencer Company, The	49
National Suppy Co.	13
Nordberg Mfg. Co.	30-54
Norma-Hoffmann Bearings Corp.	55
Petrometer Corporation	54
Pierce Governor Co., The	6
Schoonmaker Corp., A. G.	54
Socony-Vacuum Oil Corp.	Second Cover
Standard Oil Co. of California	50-51
Standard Oil Co. (Indiana)	4
Staynew Filter Corp.	12
Stover Mfg. & Engine Co.	55
Superior Diesels	13
Taylor Manufacturing Corp.	55
Texas Company, The	20
Tide Water Associated Oil Company	28-29
Timken Roller Bearing Co.	14
United American Bosch Corp.	55
Viking Instruments, Inc.	55
Westinghouse Elec. & Mfg. Co.	16
Weston Electrical Instruments Corp.	52
Worthington Pump & Machinery Corp.	17
Youngstown Miller Co.	1

ONLY BUCKEYE DIESELS



GIVE YOU ALL THESE FEATURES

1. Silent Watchman (Patented).
2. Full pressure lubrication system.
3. Sleeve cylinders.
4. Exhaust and intake manifolds not bolted to cylinder head.
5. Reversible shell type silver alloy bearings.
6. Individual pump for each cylinder.
7. Completely enclosed.

They insure long life, high efficiency, low maintenance—all meaning lower power costs.

Write for catalogs on your letter-head.

The Buckeye Machine Co.
Lima, Ohio
Engine Builders Since 1908

CRACKED HEADS WELDED
• ENGINES REPAIRED
VALVE SEATS
HARD SURFACED
Satisfaction Guaranteed
BRODIE SYSTEM
AN ENGINEERING SERVICE
117 Clifton Pl.
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New York

Deutz { DIESEL ELECTRIC POWER STATIONS
DIESEL TRUCKS
DIESEL MARINE ENGINES
4 TO 3000 HP.
DIESEL DYNAMICS CORP.
General Importers of Deutz Diesel Engines for U.S.A.
233 BROADWAY : Woolworth Building : NEW YORK
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AMERICAN-BOSCH
DIESEL INJECTION EQUIPMENT
UNITED AMERICAN BOSCH CORPORATION
SPRINGFIELD, MASS. New York Chicago Detroit

ALNOR EXHAUST PYROMETERS
ILLINOIS TESTING LABORATORIES, INC.
423 N. LASALLE ST. CHICAGO, ILL.

Taylor HYDRAULIC DYNAMOMETERS
TAYLOR MANUFACTURING CORP.
2330 WEST CLYBOURN ST., MILWAUKEE, WIS.

ORDERS!!

THE Diesel engine business on the Eastern Seaboard is definitely better. As a matter of cold hard fact, the volume of orders obtained in the past thirty days exceeds the volume booked in this same period last year. Hereunder we are briefly listing some of the more important sales closed by the New York branches of three of the leading Diesel engine builders.

FAIRBANKS-MORSE

A 575 hp. 5-cylinder 14″ x 17″ engine direct connected to a 14″ Morris pump for the dredger *Inverlago* owned by the Standard Oil Company of New Jersey.

A 450 hp. 5-cylinder engine for the 100-ft. steel tug *Stephen F. Austin*, designed by U. S. Engineers, Galveston, Texas, built by Spedden Shipbuilding Company.

A 300 hp. 4-cylinder 14″ x 17″ engine for the oyster dredge *Sealshipt* of the Bluepoints Company, well known Long Island oyster company. The installation is being handled by the Hitchcock Gas Engine Company of Bridgeport.

A 450 hp. 5-cylinder engine for the freighter *Big Chief* of the Pocahontas Coal Company.

A 120 hp. 4-cylinder engine 8¾″ x 10½″ for a yard tug of the Newport News Shipbuilding Co.

A 150 hp. 5-cylinder engine 8¾″ x 10½″ for the freighter *Beswick* owned by Whitehead Bros. The installation is being made by the Hitchcock Gas Engine Company.

A 120 hp. 4-cylinder engine 8¾″ x 10½″ for the dragger *Col. Lindbergh* and a 90 hp. 3-cylinder engine for the fishing boat *Althea II*. Installations in these two vessels are being made at Jensen's at Sayville, Long Island.

A 300 hp. 4-cylinder 14″ x 17″ engine for the tug *Harvard* for the Jamaica Bay Towing Company, a conversion from steam to Diesel.

ATLAS IMPERIAL

A 380 hp. 6-cylinder 13″ x 16″ engine together with a 15 hp. auxiliary Diesel-electric set for an 84-ft. tug of The Texas Company. The vessel is intended to ply between Port of Spain, Trinidad, and the Orinoco River in Venezuela. Companions to this tug will be two houseboats fitted with Atlas Imperial 15 hp. Diesel-electric sets. These houseboats will be stationed at Trinidad.

A 380 hp. engine of 6-cylinders 13″ x 16″ for an 80-ft. tug of the Solvay Process Company of Syracuse, N. Y.

Two 6-cylinder 10″ x 13″ engines of 200 hp. each for the twin screw ferry *Maracaibo*, together with two 10 hp. 7½ kw. Diesel-electric sets. This vessel was designed by Eads Johnson.

A 380 hp. engine for the tug *Dauntless V*. This is another conversion from steam power, the *Dauntless I*. having been converted from steam to Diesel engine some time ago. The latter was also powered with an Atlas Imperial Diesel.

A 4-cylinder 110 hp. engine 9″ x 12″ for the 70-ft. dragger owned by John Bruno of Boston, Mass., under construction at Jacob Story's Yard, Essex, Mass.

Two 6-cylinder 10″ x 13″ 200 hp. engines for the freighter *Eastern Shore* owned by the Newcastle Terminal Company of Baltimore, Md.

A 200 hp. 10″ x 13″ 6-cylinder engine for the tug *Schoodic* owned by H. B. Messenger of Federalsburg, Md.

A 4-cylinder 60 hp. engine for the dragger *Jessie Dutra* of Provincetown, Mass.

A 380 hp. engine for the tug *Columbia* of the Eastern Transportation Company of Baltimore, Md. This is a conversion from steam to Diesel.

A 275 hp. 6-cylinder engine of 11½″ x 15″ for a 135-ft. Grand Banks fishing schooner of the National Maritime Fish Company of Halifax, Nova Scotia.

COOPER-BESSEMER

One 300 hp. and two 200 hp. engines for tenders, New York Shipbuilding Company.

Twelve 320 hp. Diesel-generator sets, Maritime Commission, for Sun Shipbuilding Company.

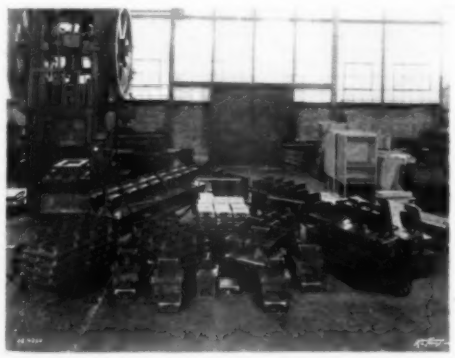
One 450 hp. engine for Henje's Towing Co.

Two 360 hp. engines for Petro Machinery Co.

One 200 hp. engine for the Atlantic Caribbean Steam Navigation Company.

HUSSMAN IS BUSY

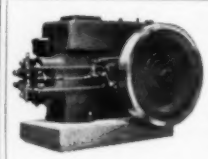
Carl Hussman, specialist in solving vibration problems, is extremely busy filling orders for Diesel engine spring mountings. Illustration shows some of the welded parts going into the construction of the spring mountings for the



three General Motors 16 cylinder engines for the Du Pont Building in Miami; for the two big G-M Diesels going into 195 Broadway, New York; for the Springfield, Mass., Superior Diesel water works job, not to mention three big government contracts. It apparently pays to advertise in DIESEL PROGRESS.

Save maintenance and operating costs with MACMILLAN ring free motor oil.

MACMILLAN PETROLEUM CORP.
50 W. 50th St., New York 624 S. Michigan Ave., Chicago
530 W. 6th St., Los Angeles



Sendling Diesel
5 — 15 H. P.
4-CYCLE
Acro combustion chamber (pat.)
Renewable cylinder liner
Bosch pump — Bosch nozzle
Delivered Complete — Ready for Service
FRANK BAUER and CO.
ENGLEWOOD, NEW JERSEY

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Complete, individual instruction including practical work in our own shops on all types of Diesel Engines and injection systems, qualifies Delehanty Diesel graduates for all positions connected with the operation, repair, maintenance and sales of Diesel equipment. When you need trained men consult us! No charge to either employers or graduates.
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A VIBRATION PROBLEM SOLVED

Red River Refining Co. at Burnham, Ill. had a real problem—read their letter.

THE successful solution of the difficult problems submitted to us by the Red River Refining Company but typifies the type of work in which we specialize. Each problem is different, each problem calls for individual analysis and specific recommendations.

Hussman spring mountings are produced in various models to meet varying needs. On the basis of our investigation and analysis of your individual problem we submit recommendations as to the type and number of Hussman spring mountings the specific job will require. We then guarantee the result.

Red River Refining Company

PETROLEUM REFINERS

Chicago, Illinois

13921 Mackinaw Avenue

SCHULZE VACUUM PROCESS

March 17, 1938

Carl Hussman, Engineers
120 South La Salle Street
Chicago, Illinois

Gentlemen:

We acknowledge receipt of your letter of March 11th, requesting permission to use one of the photographs of our Diesel Generator installation for advertising purposes. You have our unqualified consent to make use of any one or all of the photographs which we sent to you.

We know you will be gratified to learn of the 100% satisfactory performance derived from your Spring Mountings, installed under our two sets of National Superior 9 x 12, four cylinder, four cycle, 600 R.P.M. Diesel Generators with exciter and water pump. We regret very much that your Mountings were unknown to us at the time of making our original installation of the Power Plant as we would have eliminated the time and expense involved, installing the elaborate isolation Cork foundation that proved entirely ineffective. Excessive vibration was transmitted throughout the plant and surrounding neighborhood to a very serious degree while the units operated on the heavy concrete foundations, isolated completely with cork on the bottom and sides.

It was indeed fortunate for us that you were able to design the Spring Mountings to maintain the same position of the units that eliminated any necessity of changing the piping, other than installing a flexible connection on the exhaust lines.

We were somewhat in doubt at first whether your Spring Mounting would detract from the desired good appearance of the installation, but we can frankly say, your design and construction has not impaired the appearance in the least and above all, you have given us a job which is absolutely perfect in vibration absorption.

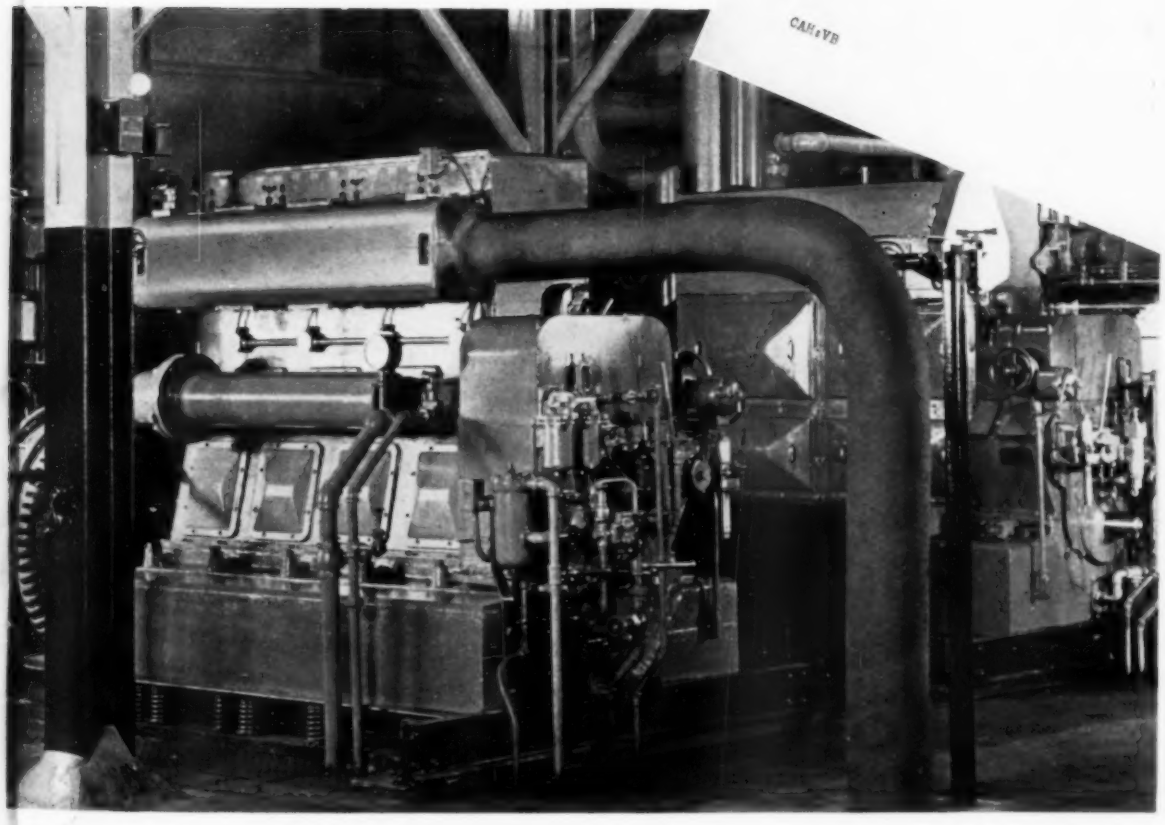
You can be assured we will gladly discuss or show our installation to anyone interested in these Mountings.

Very truly yours,

RED RIVER REFINING COMPANY

C. A. Harris
Refinery Superintendent

CAH:VB



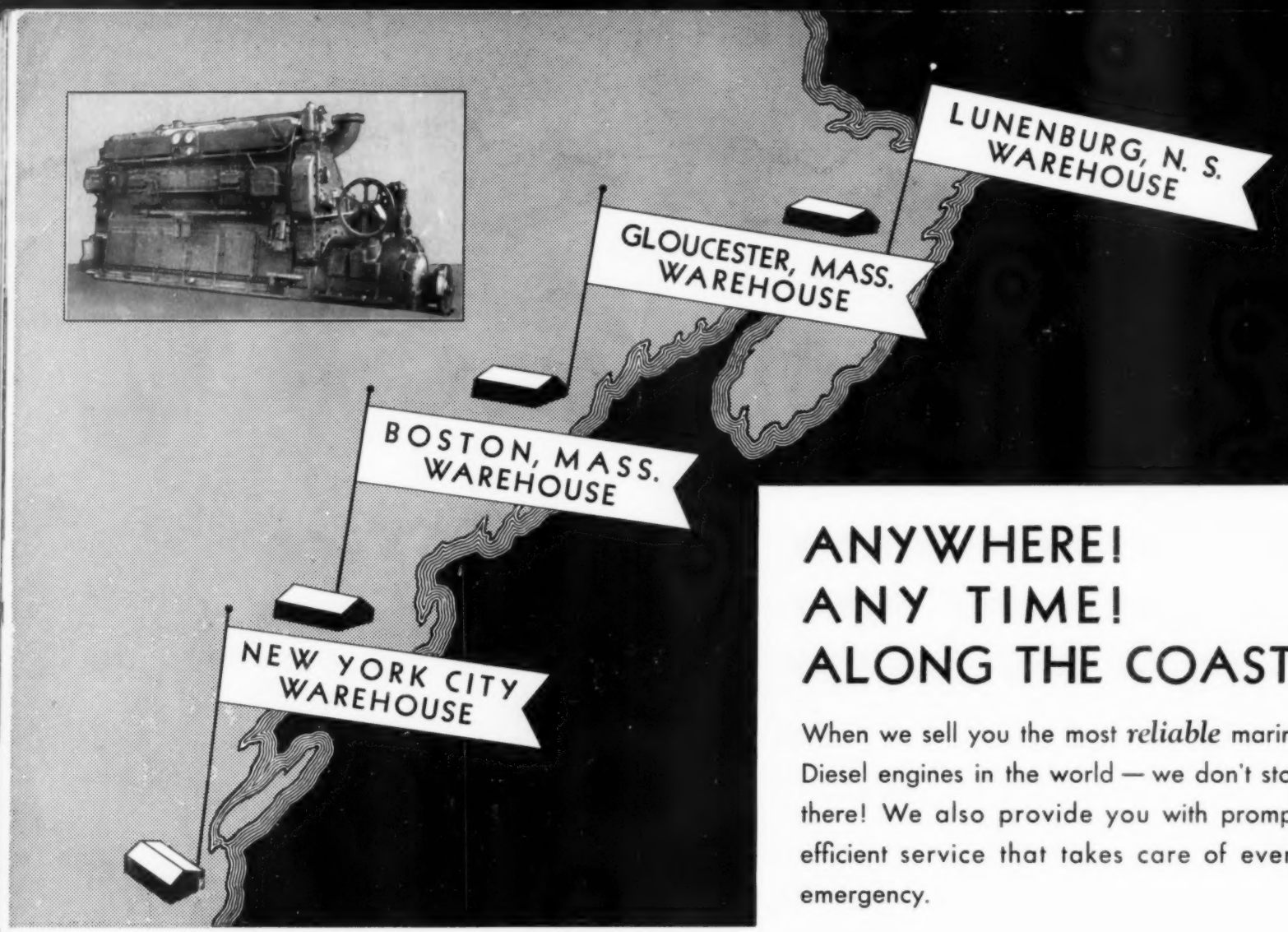
A pair of 9" x 12" Superior Diesels, four cycle, four cylinder, 600 rpm. now successfully operating on Hussman Spring Mountings in the plant of the Red River Refining Co. at Burnham, Ill,

Send full details of your noise or vibration abatement problems to us and we will promptly submit an individual and comprehensive recommendation.

CARL HUSSMAN

Specialist in solving vibration problems

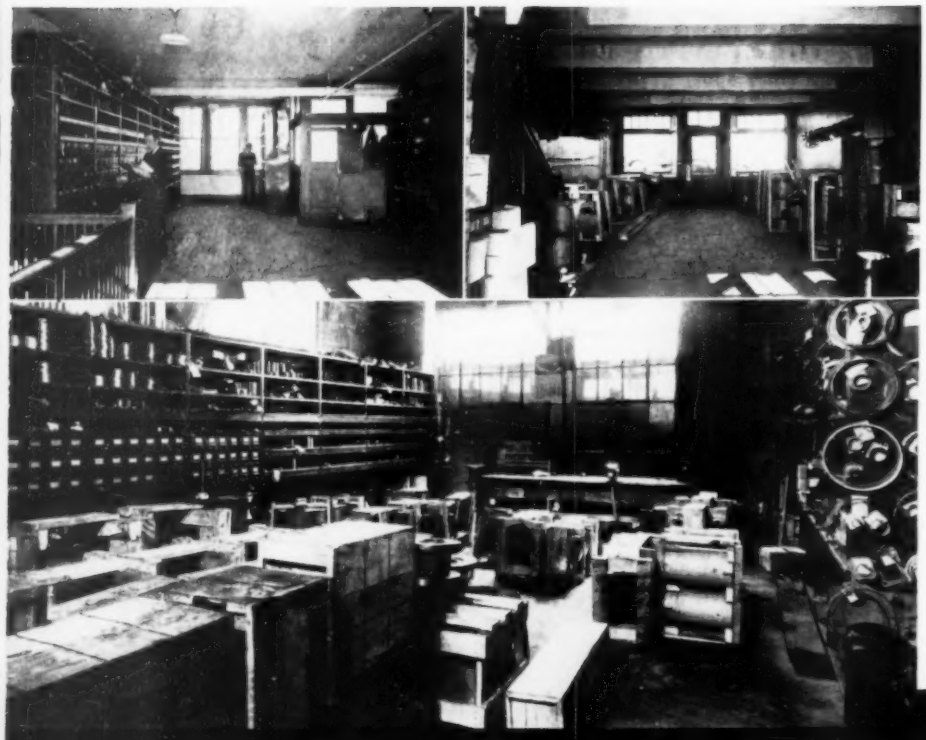
120 SOUTH LA SALLE ST., CHICAGO, ILL.



ANYWHERE! ANY TIME! ALONG THE COAST!

When we sell you the most *reliable* marine Diesel engines in the world — we don't stop there! We also provide you with prompt, efficient service that takes care of every emergency.

COOPER-BESSEMER PARTS and SERVICE



Service men, and large stocks of spare parts, are always available to you at convenient points along the coast.

In the Boston or Gloucester area, you have the combined facilities of *both* warehouses . . . Nova Scotian and American boats are served by our Lunenburg warehouse . . . New York and Virginia waters by our New York City warehouse . . . just a "sample" of what we mean by SERVICE!

Our Boston Warehouse (above left) is located on Northern Avenue, practically on the fish pier, our Gloucester Warehouse (below left) just a block from the water front! Both convenient locations for boats that require Cooper-Bessemer service and parts!

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Mills Building, Washington, D. C.
Hoffar's Limited, Vancouver, B. C.
49 Duncan Street, Gloucester, Mass.
529 M & M Building, Houston, Texas
640 East 61st Street, Los Angeles, Calif.
Calmes Engineering Co., New Orleans, La.
The Pacific Marine Supply Co., Seattle, Wash.

ON THE SEA • IN THE AIR • IN INDUSTRY • IN TRANSPORTATION